POWERWARE® 9330

Uninterruptible Power Supply

10 kVA - 20 kVA
25 kVA - 40 kVA

Installation and Operation Manual

164201300 Rev. G

IMPORTANT SAFETY INSTRUCTIONS

Instructions Importantes Concernant La Sécurité

SAVE THESE INSTRUCTIONS

Conserver Ces Instructions

This manual contains important instructions for your Uninterruptible Power Supply (UPS) system. You should follow these instructions during the installation and maintenance of the UPS, options, accessories, and batteries.

Cette notice contient des instructions importantes concernant la sécurité.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

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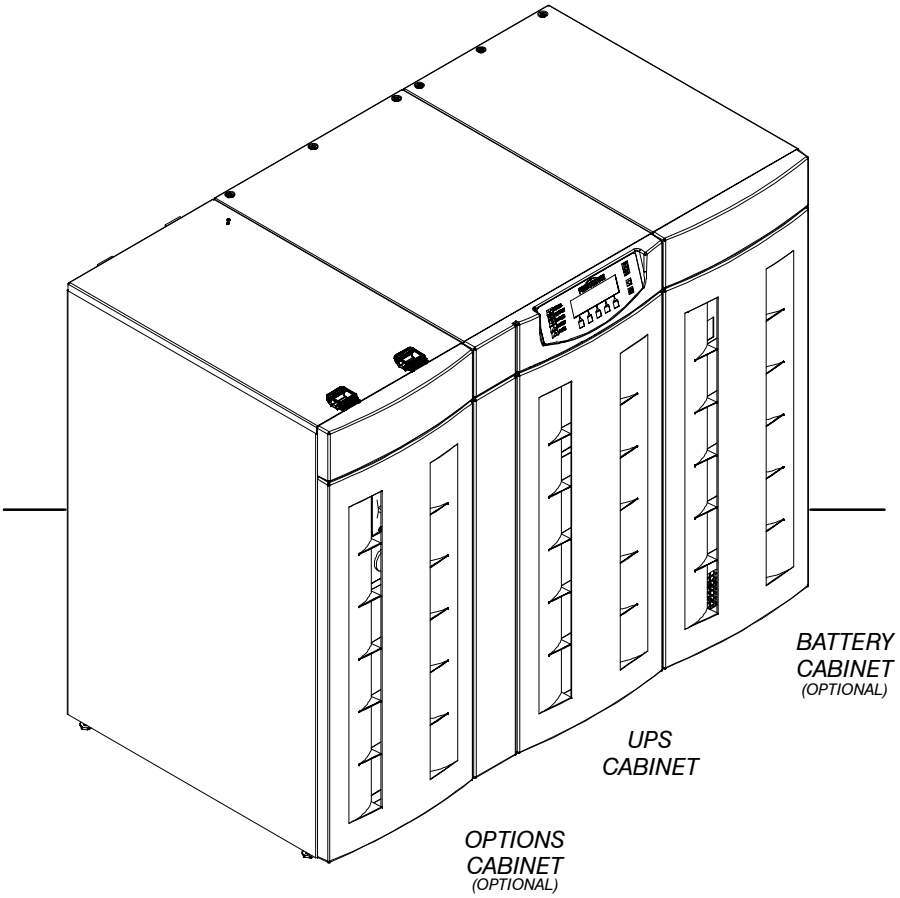
Introduction

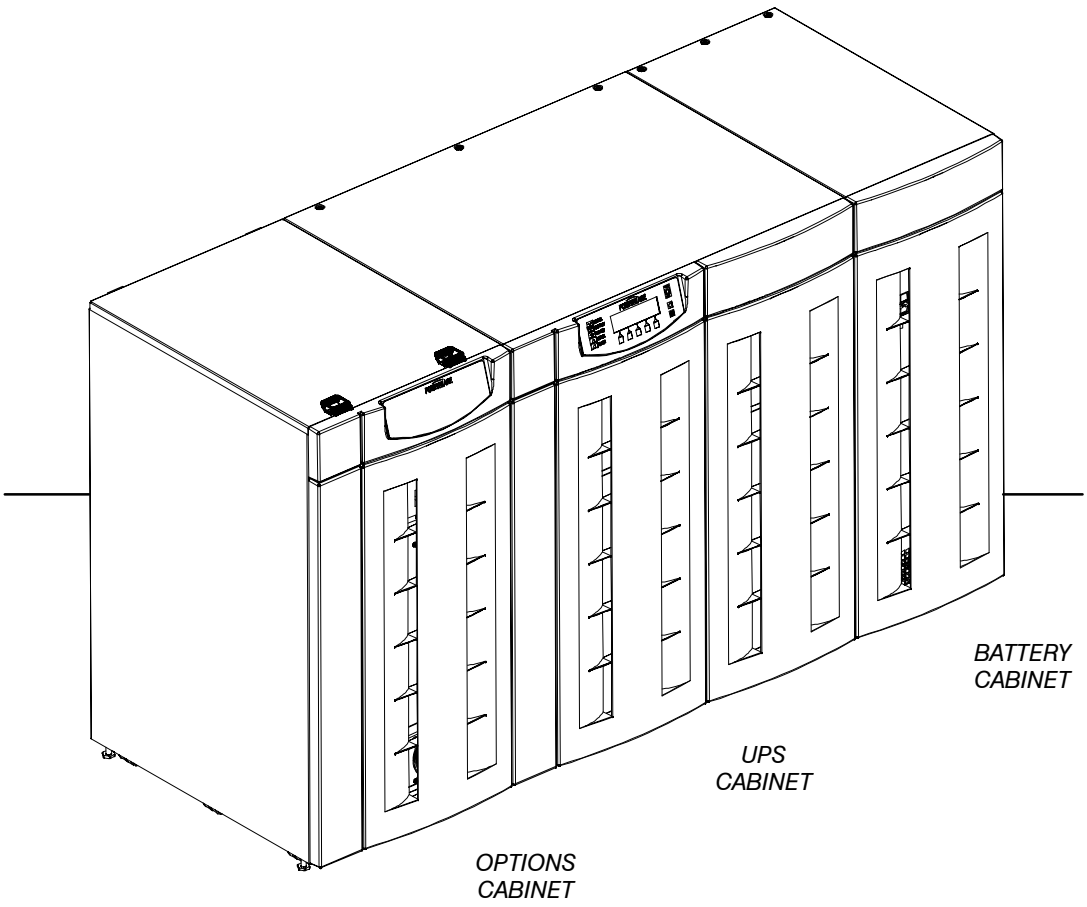
Powerware 9330 UPS true double conversion online power protection can be utilized to prevent loss of valuable electronic information, minimize equipment downtime, and/or minimize the adverse effect on equipment production due to unexpected power problems.

The Powerware UPS System continually monitors incoming electrical power and removes the surges, spikes, sags, and other irregularities that are inherent in commercial utility power. Working with your building's electrical system, the UPS System supplies clean, consistent power that your sensitive electronic equipment requires for reliable operation. During brownouts, blackouts, and other power interruptions, internal and optional external battery strings provide emergency power to safeguard your operation.

The UPS system is housed in free-standing cabinets. The cabinet sections line up and match in style and color, and have safety shields behind the front panels for hazardous voltage protection. The following illustrations depict a typical Powerware 9330 (10 kVA–20 kVA) UPS System and a typical Powerware 9330 (25 kVA–40 kVA) UPS System



Typical Powerware 9330 (10 kVA–20 kVA) UPS System



Typical Powerware 9330 (25 kVA–40 kVA) UPS System

System Configurations

These UPS system configurations are possible:

- Single Module UPS with integral battery
- Single Module UPS with integral battery and optional options cabinet
- Single Module UPS with integral battery and optional battery cabinet
- Single Module UPS with integral battery, optional battery cabinet, and optional options cabinet
- Single Module UPS with remote battery
- Single Module UPS with remote battery and optional options cabinet

- Parallel System with one to four UPS modules with remote battery and optional options cabinet
- Parallel System with one to four UPS modules and integral battery
- Parallel System with one to four UPS modules, integral battery, and optional battery cabinet
- Parallel System with one to four UPS modules and remote battery

You can enhance any of these system configurations by adding an optional accessories, such as a *Remote Emergency Power Off (EPO)* control, a *Remote Monitor Panel (RMP),* and X−Slot communications connectivity features.

Using This Manual

Your UPS functions automatically and requires very little attention during normal operation. However, you should read and understand the procedures described in this manual to ensure trouble-free operation. In particular, you should be thoroughly familiar with the Remote Emergency Power Off procedure described in Chapter 9 of this manual.

The information in this manual is divided into the sections and chapters listed. The system you are installing dictates which parts of this manual you should read. Everyone should read, at a minimum, the Introduction, Chapters 1, 2 , 8, and 9.

Introduction

The Introduction provides a brief description of the UPS system, a description of the content of each chapter, safety, text conventions used in the manual and reference information.

Section I

- **Chapter 1 -- Getting Started --** tells you how to prepare your site for the installation of your UPS system. It discusses equipment environmental requirements, inspecting, and unpacking cabinets.
- **Chapter 2 -- Installing the UPS System --** describes how to install the UPS cabinets and optional equipment.
- **Chapter 3 -- Installing Batteries --** provides battery safety, installation and connection information.
- **Chapter 4 -- Installing a Remote EPO Control --** contains information for installing the optional *Remote Emergency Power Off (EPO)* control.
- **Chapter 5 -- Installing a Remote Monitor Panel --** contains information for installing the optional *Remote Monitor Panel (RMP)*.

Section II

- **Chapter 6 -- Understanding UPS Operation --** provides information on understanding UPS operation.
- **Chapter 7 -- Operational Controls and Features --** describes the standard and optional operational features and controls of the UPS system.

- **Chapter 8 -- Using the Control Panel --** describes the controls and indicators found on the Control Panel and shows the various information screens displayed on the LCD screen.
- **Chapter 9 -- UPS Operating Instructions --** contains startup and shutdown procedures for the UPS system.
- **Chapter 10 -- Using Features and Options --** contains descriptions and instructions for the UPS system features and options.
- **Chapter 11 -- Responding to System Events --** lists all the alarm messages and notices that occur during operation of the UPS system.
- **Chapter 12 -- Serial Communications --** describes the serial communications features of the UPS system.
- **Chapter 13 -- Remote Notification --** contains instructions for using the remote notification feature of the UPS system.
- **Chapter 14 -- Maintaining the UPS System --** contains maintenance instructions for the UPS system.
- **Chapter 15 -- Product Specifications --** provides detailed specifications for the UPS system.
- **Appendix A --Customer Information --** contains important information on wiring requirements and recommendations, and important diagrams of the cabinet's mechanical details and electrical access.
- **Warranty --** provides the Powerware warranty for this product.

Read through each procedure before you begin. Perform only those procedures that apply to the UPS system you are installing or operating.

Conventions Used in This Manual

The text in this manual uses these conventions:

- **Bold type** highlights important concepts in discussions, key terms in procedures, and menu options.
- *Italic type* highlights notes and new terms where they are defined.
- Rectangular boxes containing bold type are warnings or cautions that pertain to the UPS system or its electrical connections.

In this manual, the term *UPS* refers only to the UPS cabinet and its internal elements. The term *UPS system* refers to the entire power protection system—the UPS modules, battery strings and options or accessories installed.

Safety Considerations

The UPS cabinet is designed for industrial or computer room applications, and contain safety shields behind the doors. However, the UPS system is a sophisticated power system and should be handled with appropriate care, following these guidelines:

- **Keep surroundings clean and free from excess moisture.**
- **Do not operate the UPS system close to gas or electric heat sources.**
- **The system is not intended for outdoor use.**
- **The operating environment should be maintained within the parameters stated in this manual.**
- **Keep the cabinet doors closed and locked to ensure proper cooling airflow and to protect personnel from dangerous voltages inside the unit.**
- **The UPS system contains its own power source. Lethal voltages are present even when the UPS is disconnected from utility power.**

WARNING:

Only AUTHORIZED SERVICE PERSONNEL should perform maintenance on or service the UPS system.

If service or routine maintenance is required:

- **Ensure all power is disconnected before performing installation or service.**
- **Ensure the area around the UPS system is clean and uncluttered.**
- **Battery maintenance or battery replacement should be performed only by authorized service personnel.**
- **Observe all DANGER, CAUTION, and WARNING notices affixed to the inside and outside of the equipment.**

For More Information

This manual describes how to install and operate the UPS modules. For more information about the installation and operation of a Parallel System, refer to the following:

164201363 ***Powerware® 9330 Parallel System Installation and Operation Manual***

The Installation section, provides installation instructions for the Parallel cabinet. Site preparation, planning for installation, and wiring and safety information are supplied. Detailed illustrations of the cabinet, including dimensional and connection point drawings are provided.

The Operation section, explains the functions of the Parallel System; ; provides procedures for operating the Parallel System, and information about maintenance and responding to system events.

Contact your local Powerware Field Service office for information on how to obtain copies of this manual.

Getting Help

If you need to schedule initial startup, need regional locations and telephone numbers, have a question about any of the information in this manual, or have a question this manual does not answer, please call Powerware Corporation at:

United States	**1-800-843-9433**
Canada	**1-800-461-9166**
Outside the U.S.	**Call your local representative**

Section I

Installation

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Getting Started

1.1 Installing the UPS

The cabinet sections of the *UPS* are shipped on separate pallets. Use a forklift or pallet jack, rated to handle the weight of the cabinets (refer to Drawing 164201300−3 in Appendix A for cabinet weights), to move the packaged cabinet sections to the installation site, or as close as possible to the site, before unloading from the pallet.

This is the basic sequence of the installation steps:

1. Create an installation plan for the UPS system (Chapter 1).
2. Prepare your site for the UPS system (Chapter 1).
3. Inspect, unpack, and unload the UPS cabinet sections (Chapter 1).
4. Wire the system (Chapter 2).
5. Install features, accessories, and/or options, as applicable (Chapter 3).
6. Complete the Installation Checklist (Chapter 2).
7. Have authorized service personnel perform preliminary operational checks and startup.

NOTE: *Startup and operational checks should be performed only by authorized service personnel. This service is usually offered as part of the sales contract for your UPS. Contact service in advance (usually a two week notice is required) to reserve a preferred startup date.*

1.1.1 Creating an Installation Plan

Before beginning to install the UPS system, read and understand how this manual applies to the system being installed. Use the procedures and illustrations in the following chapters to create a logical plan for installing the system.

1.1.2 Preparing Your Site

For your UPS system to operate at peak efficiency, your installation site should meet the environmental parameters outlined in this manual. If you intend to operate the system at an altitude higher than 1500 meters (5000 feet), contact your local sales or service office for important information about high altitude operation. The operating environment must meet the weight, airflow, size and clearance, requirements specified in Appendix A.

The basic environmental requirements for operation of the UPS system are:

Ambient Temperature Range: 0−40˚C (32−104˚F)

Recommended Operating Range: 20−25˚C (68−77˚F)

Maximum Relative Humidity: 95%, noncondensing

The UPS cabinets use forced air cooling to regulate internal component temperature. Air inlets are in the front of the cabinet, and outlets are in the rear of the cabinet. You must allow clearance in front of and behind each cabinet for proper air circulation. Refer to Drawing 164201300−3 of Appendix A for clearance requirements.

1.1.3 Environment Considerations

The life of the UPS system is adversely affected if the installation does not meet the following guidelines:

1. The system must be installed on a level floor suitable for computer or electronic equipment.
2. The system must be installed in a temperature-controlled indoor area free of conductive contaminants.

Failure to follow guidelines may invalidate UPS warranty.

1.1.4 Preparing for Wiring the UPS System

For external wiring requirements, including the minimum AWG size of external wiring, refer to Tables A through F in Appendix A for the Powerware 9330 (10 kVA−20 kVA) UPS or Tables G through M in Appendix A for the Powerware 9330 (25 kVA−40 kVA) UPS. The power wiring connections for this equipment are rated at 90˚C. Control wiring for EPO and optional accessories (such as building alarms, and monitoring interface) should be connected at the customer interface panels and terminal blocks located inside the UPS using class 1 wiring methods.

1.1.5 Inspecting and Unpacking Each Cabinet

The first task in preparing for installation is inspecting and unpacking the UPS sections. The UPS and accessory cabinets are shipped bolted to wooden pallets, as shown in Figures 1–1 or 1–2, and protected with outer protective packaging material.

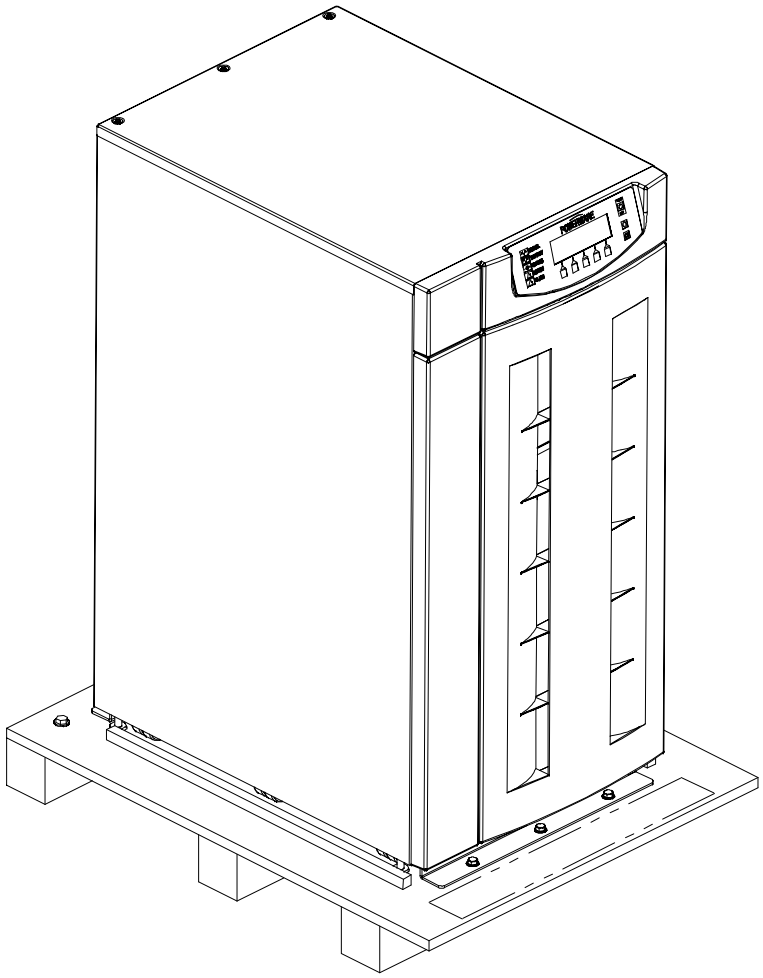

Figure 1–1. Powerware 9330 (10 kVA–20 kVA) UPS Cabinet as Shipped on Pallet

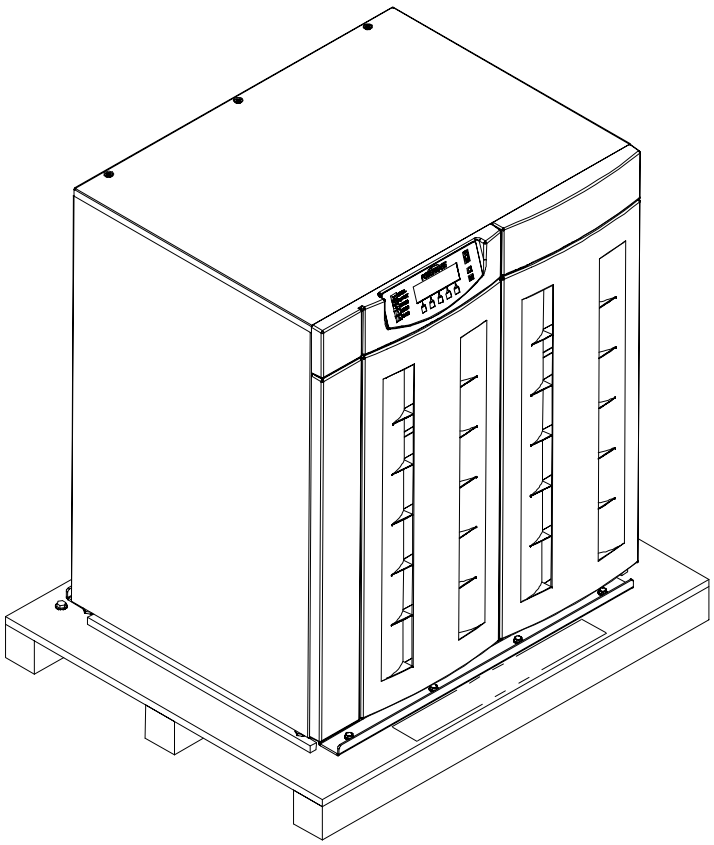

Figure 1–2. Powerware 9330 (25 kVA–40 kVA) UPS Cabinet as Shipped on Pallet

1. Carefully inspect the outer packaging for evidence of damage during transit.

CAUTION:
Do not install a damaged cabinet. Report any damage to the carrier and contact your local sales or service office immediately.

2. Use a forklift or other material handling equipment to move the cabinet to a convenient unpacking area. Insert the forklift jacks between the pallet supports on the bottom of the unit.

CAUTION:
Do not tilt cabinets more than 10 degrees from vertical.

3. Set each pallet on a firm, level surface, allowing a minimum clearance of 3 m (10 ft) on each side for removing the cabinets from the pallets.
4. Remove the protective covering from the cabinets.
5. Remove the packing material, and discard or recycle them in a responsible manner.
6. After removing the protective covering, inspect the contents for any evidence of physical damage, and compare each item with the Bill of Lading. If damage has occurred or shortages are evident, contact the Powerware, Inc. Customer Service Department immediately to determine the extent of the damage and its impact upon further installation.

NOTE: *While awaiting installation, protect the unpacked UPS cabinets from moisture, dust, and other harmful contaminants. Failure to store and protect the UPS properly may invalidate the warranty.*

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Installing the UPS System

2.1 Preliminary Installation Information

WARNING:
Installation should be performed only by qualified personnel.

Refer to the following while installing the UPS system:

- Refer to Appendix A of this manual for installation drawings and additional installation notes.
- Dimensions in this manual are in millimeters and inches.
- Do not tilt the cabinets more than ±10° during installation.
- The conduit landing plates are to be removed to add conduit landing holes as required. Plate material is 16 gauge steel (0.060 in. thick).
- The cabinets must be installed on a level floor suitable for computer or electronic equipment.
- If perforated floor tiles are required for ventilation, place them in front of the UPS. Refer to Table AA in Appendix A for equipment weight and point loading.
- Details about control wiring are provided in each procedure for connecting options and features. Drawing 164201300−2 and Tables X and Y in Appendix A identify the control wiring terminations.

2.2 UPS Cabinet Installation

To install an UPS cabinet, perform the procedures in the following paragraphs.

2.2.1 Unloading the Powerware 9330 (10 kVA–20 kVA) UPS Cabinet from the Pallet

The UPS cabinet is bolted to a wooden pallet supported by wood skids. To remove the pallet, perform the following procedure:

WARNING:
The UPS cabinet is heavy. Refer to Drawing 164201300-3 in Appendix A for weight of cabinets. If unloading instructions are not closely followed, the cabinet may cause serious injury.

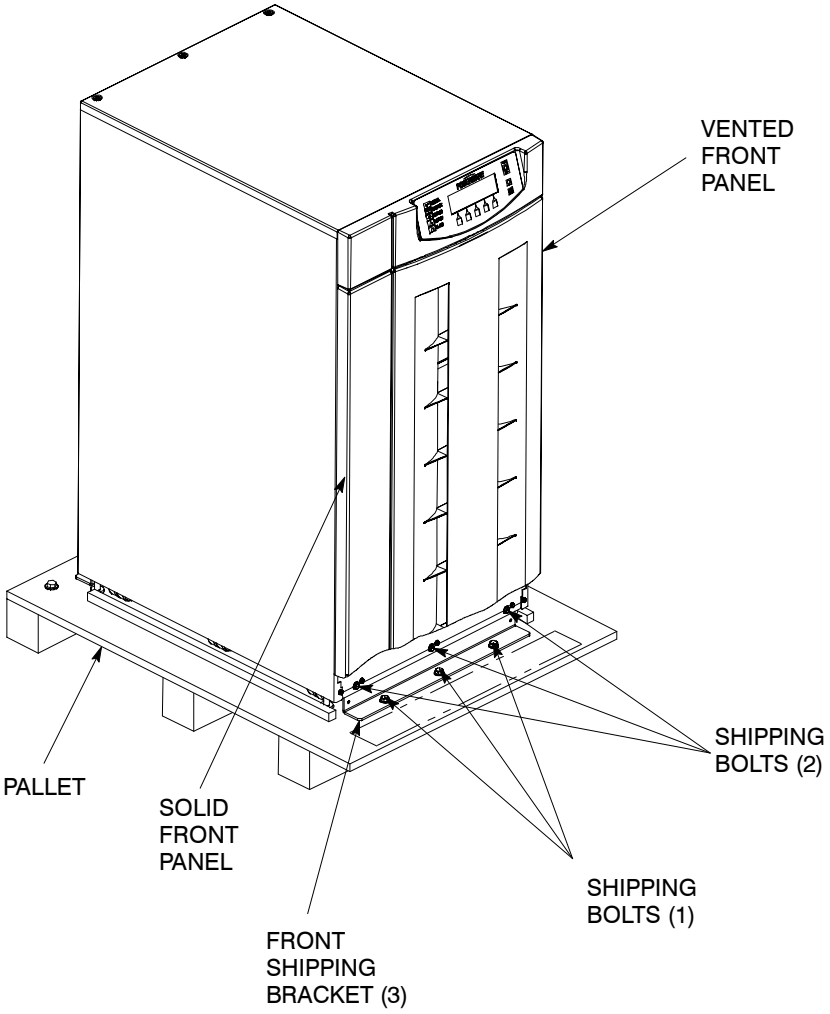
CAUTION:
Do not tilt cabinets more than 10 degrees from vertical.

1. Use a forklift or other material handling equipment to move the cabinet to the installation area. Insert the forklift jacks between the skids on the bottom of the unit.
2. Remove left front solid panel, and right front vented panel from UPS cabinet. Front panels are secured with magnetic latches and are removed by pulling panels straight forward to disengage magnetic latches (see Figure 2–1).
3. If the leveling feet are not fully retracted, turn the leveling feet until they are retracted.
4. Remove three bolts, (1) in Figure 2–2, securing the rear shipping bracket (3) to the cabinet and three bolts (2) securing the bracket to the pallet. Remove the rear shipping bracket. If installing cabinet permanently, retain shipping brackets and securing hardware for later use.
5. Remove three bolts, (1) in Figure 2–1, securing front shipping bracket (3) to the pallet. Do not remove bolts (2) securing the bracket to the cabinet.
6. Remove three bolts, (4) in Figure 2–2, securing removable skid (5) and remove skid.

NOTE: *In the following step the pallet will tilt and act as a ramp once the cabinet is rolled beyond the the center of the pallet. Make sure to restrain the cabinet as it continues to roll down the pallet/ramp. The front shipping bracket will act as a brake to assist restraining the cabinet.*

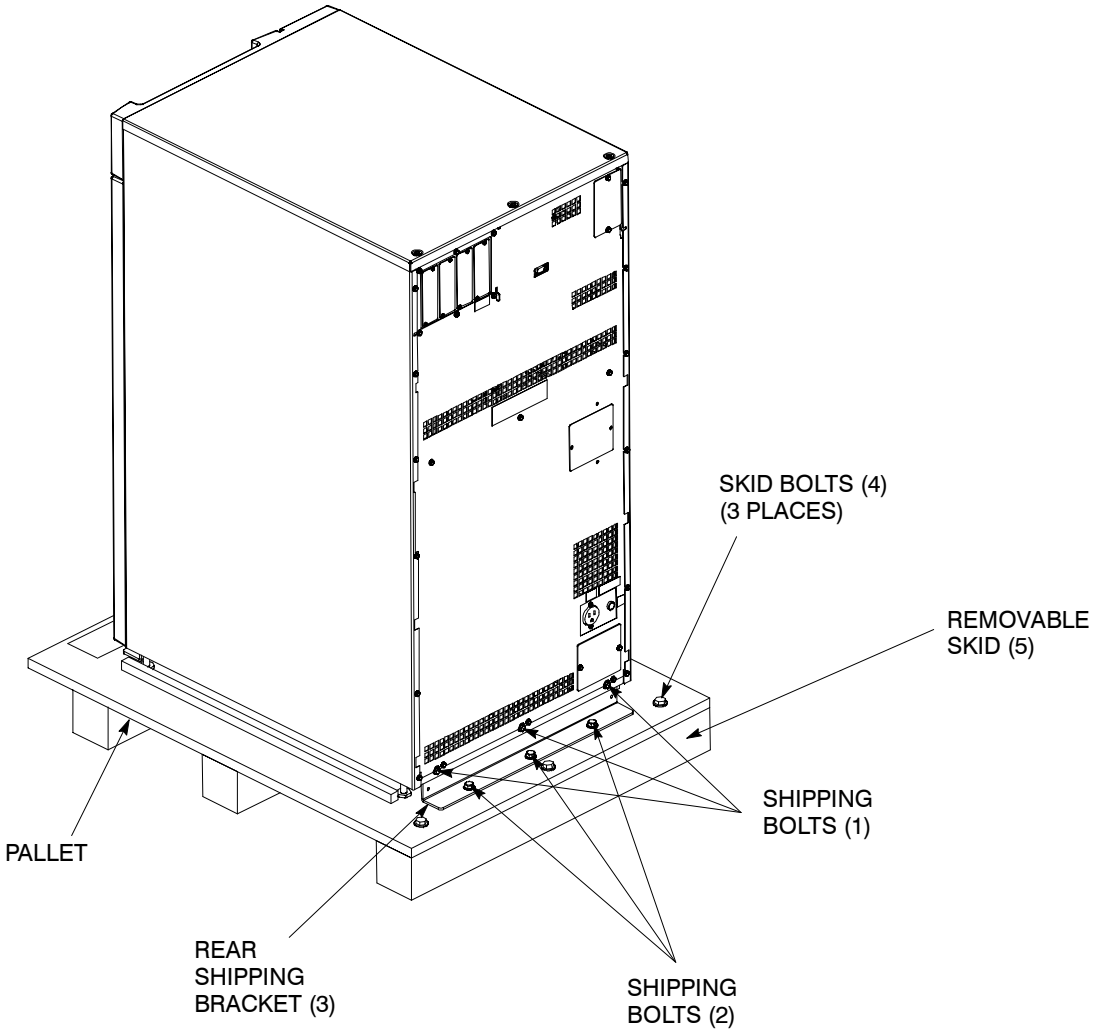
WARNING:
Do not stand directly behind the pallet while unloading the cabinet If unloading instructions are not closely followed, the cabinet may cause serious injury.

7. Slowly roll the cabinet toward the rear of the pallet. Once the pallet tilts, continue rolling the cabinet down the pallet until the cabinet is clear of the pallet.



FRONT VIEW

Figure 2–1. Removing Front Shipping Bracket (Powerware 9330 (10 kVA–20 kVA))



REAR VIEW

Figure 2−2. Removing Rear Shipping Bracket (Powerware 9330 (10 kVA−20 kVA))

8. Remove three bolts, (2) in Figure 2−1, securing front shipping bracket to the cabinet.
9. If installing cabinet permanently, retain shipping brackets and hardware; otherwise, discard or recycle the pallet and brackets in a responsible manner.
10. Roll cabinet to final installation location.
11. If permanently mounting the system, proceed to step 15; otherwise, proceed to step 12.
12. If installing a Remote Battery System, proceed to paragraph 2.2.3; otherwise, proceed to step 13.
13. Secure the UPS cabinet in position by lowering the leveling feet, until cabinet is not resting on the casters and the cabinet is level.
14. If installing Battery and Options cabinets, repeat steps 1 through 10 for remaining cabinets and proceed to paragraphs 2.3 and 2.4; otherwise, proceed to paragraph 2.2.5.
15. If installing a Remote Battery System, proceed to paragraph 2.2.3; otherwise, proceed to step 16.
16. Using retained hardware, reinstall shipping brackets previously removed to front and rear of UPS cabinet with the angle facing outward.(see Figures 2−1 and 2−2).
17. If installing Battery and Options cabinets, repeat steps 1 through 10 for remaining cabinets and proceed to paragraphs 2.3 and 2.4; otherwise, proceed to step 18.
18. Secure cabinet to floor with contractor supplied hardware and proceed to paragraph 2.2.5.

2.2.2 Unloading the Powerware 9330 (25 kVA−40 kVA) UPS Cabinet from the Pallet

The UPS cabinet is bolted to a wooden pallet supported by wood skids. To remove the pallet, perform the following procedure:

WARNING:
The UPS cabinet is heavy. Refer to Drawing 164201300-3 in Appendix A for weight of cabinets. If unloading instructions are not closely followed, the cabinet may cause serious injury.

CAUTION:
Do not tilt cabinets more than 10 degrees from vertical.

1. Use a forklift or other material handling equipment to move the cabinet to the installation area. Insert the forklift jacks between the skids on the bottom of the unit.
2. Remove left front solid panel, and front vented panels from UPS cabinet. Front panels are secured with magnetic latches and are removed by pulling panels straight forward to disengage magnetic latches (see Figure 2−3).
3. If the leveling feet are not fully retracted, turn the leveling feet until they are retracted.

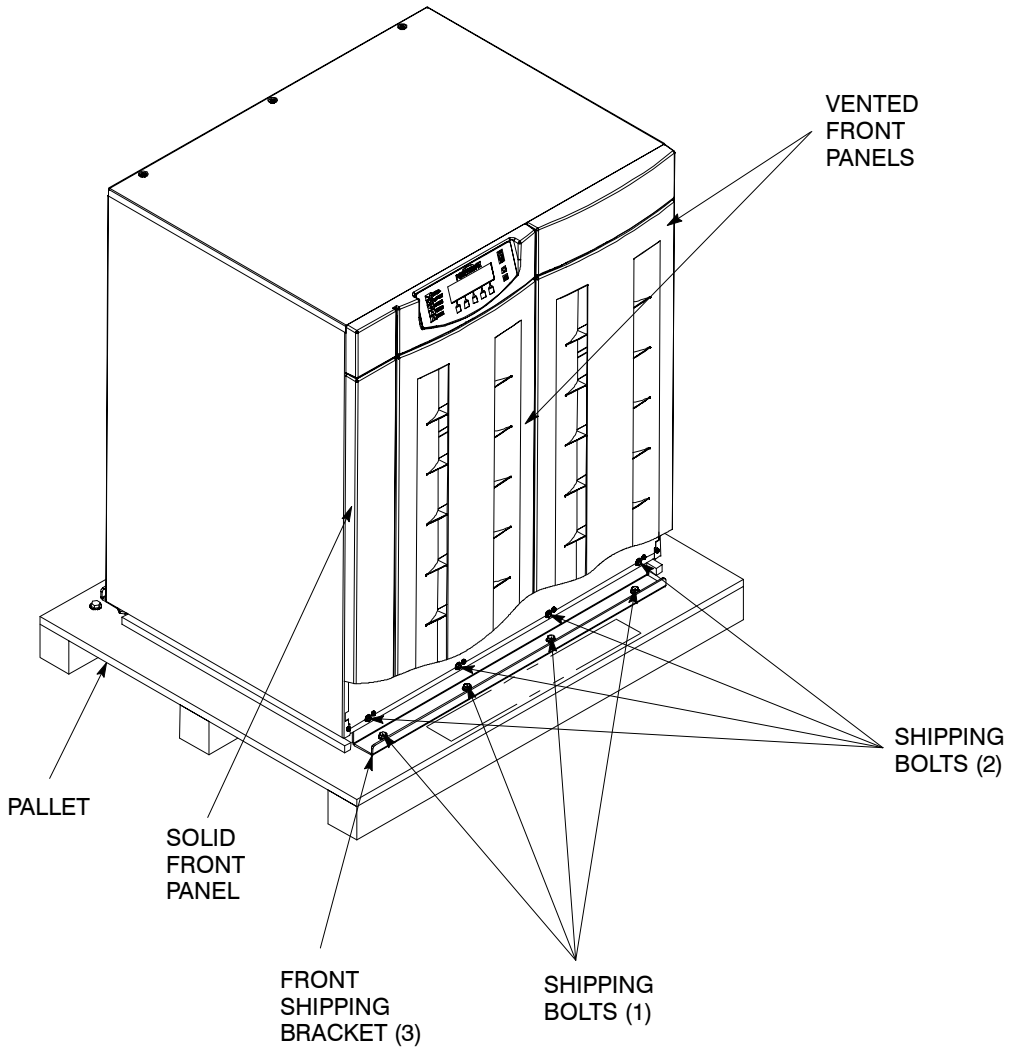
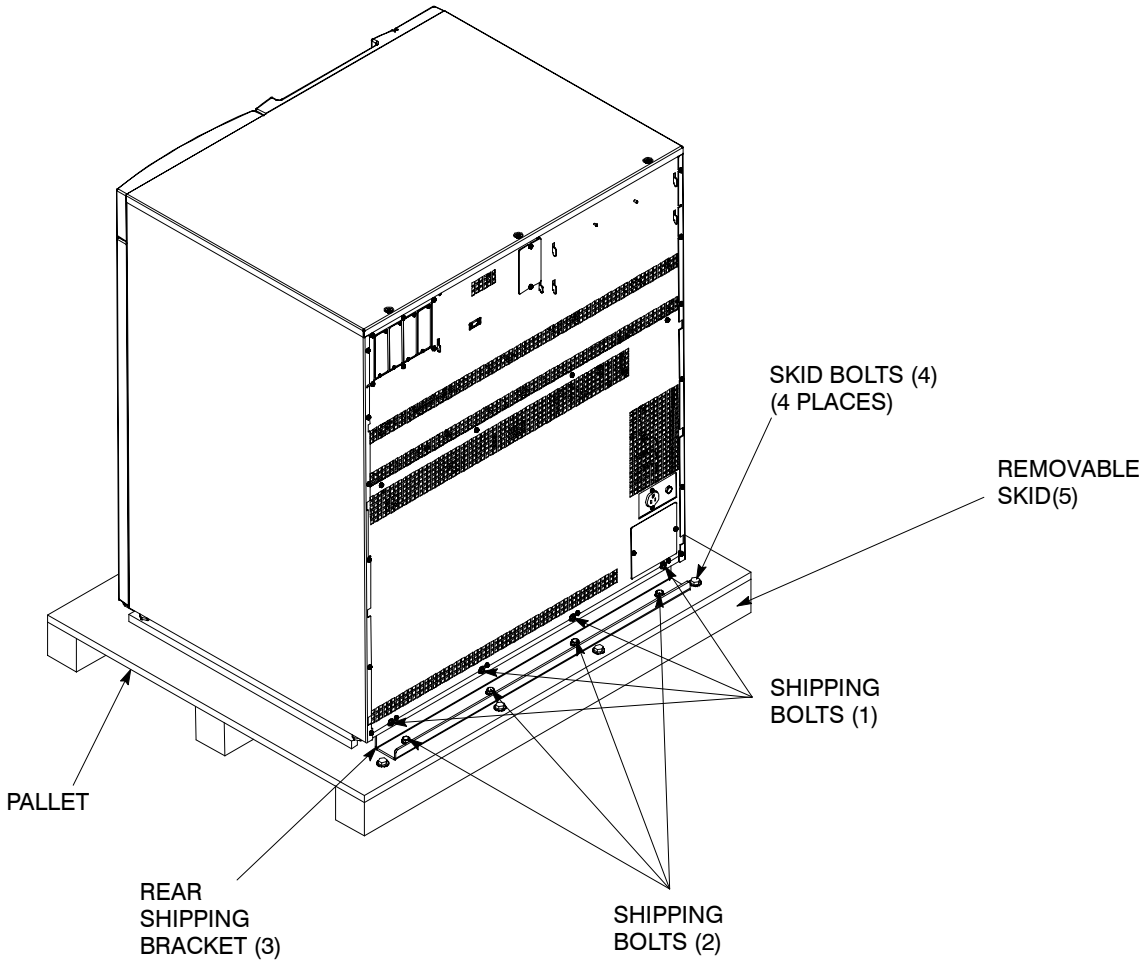


Figure 2−3. Removing Front Shipping Bracket (Powerware 9330 (25 kVA−40 kVA))



REAR VIEW

Figure 2−4. Removing Rear Shipping Bracket (Powerware 9330 (25 kVA−40 kVA))

4. Remove four bolts, (1) in Figure 2−4, securing the rear shipping bracket (3) to the cabinet and four bolts (2) securing the bracket to the pallet. Remove the rear shipping bracket. If installing cabinet permanently, retain shipping brackets and securing hardware for later use.
5. Remove four bolts, (1) in Figure 2−3, securing front shipping bracket (3) to the pallet. Do not remove bolts (2) securing the bracket to the cabinet.
6. Remove four bolts, (4) in Figure 2−4, securing removable skid (5) and remove skid.

NOTE: *In the following step the pallet will tilt and act as a ramp once the cabinet is rolled beyond the the center of the pallet. Make sure to restrain the cabinet as it continues to roll down the pallet/ramp. The front shipping bracket will act as a brake to assist restraining the cabinet.*

WARNING:
Do not stand directly behind the pallet while unloading the cabinet If unloading instructions are not closely followed, the cabinet may cause serious injury.

7. Slowly roll the cabinet toward the rear of the pallet. Once the pallet tilts, continue rolling the cabinet down the pallet until the cabinet is clear of the pallet.
8. Remove four bolts, (2) in Figure 2−3, securing front shipping bracket to the cabinet.
9. If installing cabinet permanently, retain shipping brackets and hardware; otherwise, discard or recycle the pallet and brackets in a responsible manner.
10. Roll cabinet to final installation location.
11. If permanently mounting the system, proceed to step 15; otherwise, proceed to step 12.
12. If installing a Remote Battery System, proceed to paragraph 2.2.4; otherwise, proceed to step 13.
13. Secure the UPS cabinet in position by lowering the leveling feet, until cabinet is not resting on the casters and the cabinet is level.
14. If installing Battery and Options cabinets, repeat steps 1 through 10 for remaining cabinets and proceed to paragraphs 2.3 and 2.4; otherwise, proceed to paragraph 2.2.5.
15. If installing a Remote Battery System, proceed to paragraph 2.2.4; otherwise, proceed to step 16.
16. Using retained hardware, reinstall shipping brackets previously removed to front and rear of UPS cabinet with the angle facing outward.(see Figures 2−3 and 2−4).
17. If installing Battery and Options cabinets, repeat steps 1 through 10 for remaining cabinets and proceed to paragraphs 2.3 and 2.4; otherwise, proceed to step 18.
18. Secure cabinet to floor with contractor supplied hardware and proceed to paragraph 2.2.5.

2.2.3 Installing Optional Remote Battery Power Wiring to the Powerware 9330 (10 kVA–20 kVA) UPS

If installing a remote battery system, perform the following procedure:

> CAUTION:
> When sizing battery system, do not exceed internal battery charger capabilities. Refer to Chapter 15 *"Specifications"*, for maximum battery charger currents.

1. If not already removed, remove left front solid panel and right front vented panel from the Powerware 9330 (10 kVA–20 kVA) UPS cabinet . Front panels are secured with magnetic latches and are removed by pulling panels straight forward to disengage magnetic latches (see Figure 2–1).

NOTE: *Remove UPS cabinet input, output, and remote battery input conduit landing plate to punch conduit holes.*

2. Route battery cables to UPS remote battery terminal block. Refer to Appendix A of this manual for wiring access information.
3. Connect positive, negative, and ground DC power wiring from external battery source to the DC input and ground terminals in the UPS cabinet. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information.
4. If permanently mounting the system, proceed to step 7; otherwise, proceed to step 5.
5. Secure the UPS cabinet in position by lowering the leveling feet, until cabinet is not resting on the casters and the cabinet is level.
6. If installing Battery and Options cabinets, repeat steps 1 through 10 in paragraph 2.2.1 for Battery and Options cabinets and proceed to paragraphs 2.3 and 2.4; otherwise, proceed to paragraph 2.2.5.
7. Using retained hardware, reinstall shipping brackets previously removed to front and rear of UPS cabinet with the angle facing outward.(see Figures 2–1 and 2–2).
8. If installing Battery and Options cabinets, repeat steps 1 through 10 in paragraph 2.2.1 for Battery and Options cabinets and proceed to paragraphs 2.3 and 2.4; otherwise, proceed to step 9.
9. Secure cabinet to floor with contractor supplied hardware and proceed to paragraph 2.2.5.

2.2.4 Installing Optional Remote Battery Power Wiring to the Powerware 9330 (25 kVA–40 kVA) UPS

If installing a remote battery system, perform the following procedure:

> CAUTION:
> When sizing battery system, do not exceed internal battery charger capabilities. Refer to Chapter 15 *"Specifications"*, for maximum battery charger currents.

1. If not already removed, remove left front solid panel, and front vented panels from the Powerware 9330 (25 kVA–40 kVA) UPS cabinet . Front panels are secured with magnetic latches and are removed by pulling panels straight forward to disengage magnetic latches (see Figure 2–3).

NOTE: *Remove UPS cabinet input, output, and remote battery input conduit landing plate to punch conduit holes.*

2. Route battery cables to UPS remote battery terminal block. Refer to Appendix A of this manual for wiring access information.
3. Connect positive, negative, and ground DC power wiring from external battery source to the DC input and ground terminals in the UPS cabinet. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information.
4. If permanently mounting the system, proceed to step 7; otherwise, proceed to step 5.
5. Secure the UPS cabinet in position by lowering the leveling feet, until cabinet is not resting on the casters and the cabinet is level.
6. If installing Battery and Options cabinets, repeat steps 1 through 10 in paragraph 2.2.2 for Battery and Options cabinets and proceed to paragraphs 2.3 and 2.4; otherwise, proceed to paragraph 2.2.5.
7. Using retained hardware, reinstall shipping brackets previously removed to front and rear of UPS cabinet with the angle facing outward.(see Figures 2–3 and 2–4).
8. If installing Battery and Options cabinets, repeat steps 1 through 10 in paragraph 2.2.2 for Battery and Options cabinets and proceed to paragraphs 2.3 and 2.4; otherwise, proceed to step 9.
9. Secure cabinet to floor with contractor supplied hardware and proceed to paragraph 2.2.5.

2.2.5 Installing UPS External Power Wiring

1. Remove left front solid panel and right front vented panel from the Powerware 9330 (10 kVA–20 kVA) UPS cabinet or left front solid panel and front vented panels from the Powerware 9330 (25 kVA–40 kVA) UPS cabinet. Front panels are secured with magnetic latches and are removed by pulling panels straight forward to disengage magnetic latches (see Figure 2–1 or 2–3).
2. Remove screws securing internal safety shield panels and remove panels to gain access to input and output terminals.

NOTE: *Remove UPS cabinet input and output conduit landing plate to punch conduit holes.*

3. Route input and output cables through wireway to UPS terminal blocks. Refer to Appendix A of this manual for wiring access information.
4. If wiring a single feed system, proceed to step 5; if wiring a dual feed system, proceed to step 7.
5. Connect phase A, B, C, and Neutral rectifier and bypass input power wiring from source to the bypass input terminals in the UPS cabinet. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information. Note wiring connections for single feed systems.
6. Proceed to step 10.
7. Disconnect single feed jumpers from phase A, B, and C terminals on Input Breaker CB1 and Input Terminal strip TB2. Remove jumpers from cabinet.
8. Connect phase A, B, and C rectifier input power wiring from source to the rectifier input terminals on Input Breaker CB1 in the UPS cabinet. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information. Note wiring connections for dual feed systems.
9. Connect phase A, B, C, and Neutral bypass input power wiring from source to the bypass input terminals on Input Terminal strip TB2 in the UPS cabinet. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information. Note wiring connections for dual feed systems.

NOTE: *If connecting the UPS to a Parallel Cabinet, refer to Powerware 9330 Parallel Cabinet Installation and Operation manual referenced in the Introduction to this manual.*

10. Connect phase A, B, and C, and Neutral power wiring from output terminals to the critical load. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information.
11. After wiring the UPS system to the facility power and critical load, be sure to ground the system according to local and/or national electrical wiring codes.
12. When all wiring is complete, connect battery strings in accordance with instructions contained in paragraph 3.4.1 of Chapter 3.
13. Secure the UPS by reinstalling safety shield panels, front vented panels, and left front solid panel.

2.2.6 Installing Customer Connections

NOTE: *If installing connections (building alarms, relay outputs, or external CAN for a Parallel System) to the Communications Server Board (CSB), you must install conduit between each device and the UPS cabinet for wiring these options. Refer to Appendix A for the location of the interface points within the UPS cabinet.*

To prepare the UPS for wiring to Customer Connections:

1. Be sure the UPS system is turned off and all power sources are removed. (See the operation section of this manual for shutdown instructions.)
2. Remove Customer Interface conduit landing plate from the UPS cabinet. Drill or punch conduit holes for interface wiring.
3. To gain access to the Communications Server Board (CSB), remove top panel from the UPS by removing screws at the back and front of the top panel.
4. Locate building alarm, relay, or CAN terminals on the CSB by referring to drawings 164201300−2 and 164201300−8.
5. Refer to Appendix A of this manual for wiring and termination requirements.
6. Reinstall Customer Interface conduit landing plate.
7. Install conduit and wiring.
8. When wiring is complete, secure UPS by reinstalling all panels removed in previous steps.

2.2.7 Prepare for Installing Accessories

NOTE: *If installing accessories, such as the Remote Emergency Power Off (REPO)switch, you must install conduit between the device and the UPS cabinet for wiring the option.*

To prepare the UPS for wiring to Accessories:

1. Be sure the UPS system is turned off and all power sources are removed. (See the operation section of this manual for shutdown instructions.)
2. If installing a Remote Monitor Panel (RMP), proceed to Chapter 5; otherwise proceed to step 3.
3. Remove Customer Interface conduit landing plate from the UPS cabinet. Drill or punch conduit holes for interface wiring.
4. To gain access to the Communications Server Board (CSB), remove top panel from the UPS by removing screws at the back and front of the top panel.
5. Locate REPO terminals on the CSB by referring to drawings 164201300−2 and 164201300−8.
6. Reinstall Customer Interface conduit landing plate.
7. Refer to Chapter 4 for installation instructions.
8. When wiring is complete, secure UPS by reinstalling all panels removed in previous steps.

2.3 Battery Cabinet Installation

To install optional battery cabinets, perform the procedures in the following paragraphs.

2.3.1 Unloading the Battery Cabinet from the Pallet

To remove the Battery cabinet from the pallet, refer to paragraph 2.2.1.

2.3.2 Joining the Battery Cabinet to the UPS Cabinet

To join battery cabinets to the UPS, perform the following steps. Refer to Figure 2−5 for non-permanent installation or Figure 2−6 for permanent installation of the Powerware 9330 (10 kVA−20 kVA) UPS and Figure 2−7 for non-permanent installation or Figure 2−8 for permanent installation of the Powerware 9330 (25 kVA−40 kVA) UPS.

1. Roll the Battery cabinet to a spot near the right side of the UPS.
2. Remove left front solid panel, and right front vented panel from the Powerware 9330 (10 kVA−20 kVA) UPS cabinet or left front solid panel and front vented panels from Powerware 9330 (25 kVA−40 kVA) UPS cabinet. Front panels are secured with magnetic latches and are removed by pulling panels straight forward to disengage magnetic latches (see Figure 2−1 or 2−3).
3. Remove front vented panel from Battery cabinet. The front panel is secured with magnetic latches and are removed by pulling panels straight forward to disengage magnetic latches.
4. Remove right side outside panel from UPS cabinet. Retain hardware.
5. Remove right side panel from Battery cabinet. Retain hardware.
6. Install side panel removed from the Battery cabinet to the right side of the UPS cabinet. Secure with screws removed from UPS cabinet.
7. Find the battery cable with 2-pole connector in the Battery cabinet. Route this connector into the UPS cabinet and mate with the matching connector in the UPS (see Figures 2−5, 2−6, 2−7, or 2−8).
8. Push the Battery cabinet against the right side of the UPS cabinet.
9. If permanently mounting the system, proceed to step 16; otherwise, proceed to step 10.
10. Secure the Battery cabinet in position by lowering the leveling feet, until cabinet is not resting on the casters and the cabinet is level.
11. Secure the front of Battery cabinet to the front of the UPS cabinet by sliding the angle grounding/mounting bracket, from installation kit, behind the base of the Battery and UPS cabinets with the bottom angle facing outward (see Figures 2−5 or 2−7). Use hardware provided in the kit to secure the bracket.
12. Remove the top side panel mounting screw (tie/grounding bracket location in Figures 2−5 or 2−7) from both the Battery and UPS cabinets.
13. Secure the back of Battery cabinet to the back of the UPS cabinet with the tie/grounding bracket. Secure the bracket with the side panel mounting screws.

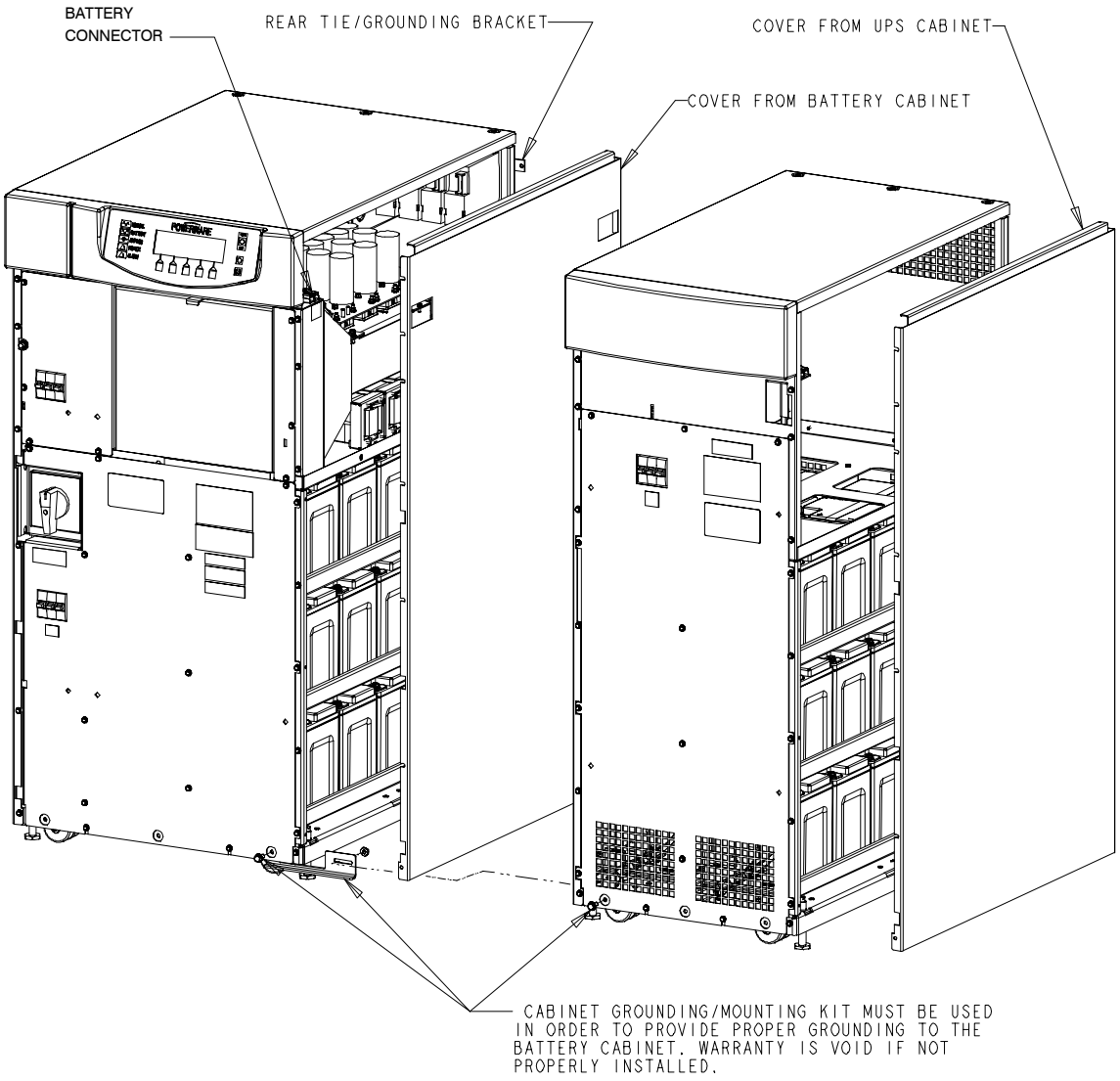

BATTERY
CONNECTOR
REAR TIE/GROUNDING BRACKET
COVER FROM UPS CABINET
COVER FROM BATTERY CABINET
CABINET GROUNDING/MOUNTING KIT MUST BE USED
IN ORDER TO PROVIDE PROPER GROUNDING TO THE
BATTERY CABINET. WARRANTY IS VOID IF NOT
PROPERLY INSTALLED.

Figure 2−5. Battery Cabinet Installation − Powerware 9330 (10 kVA−20 kVA) (Non−Permanent Mounting)

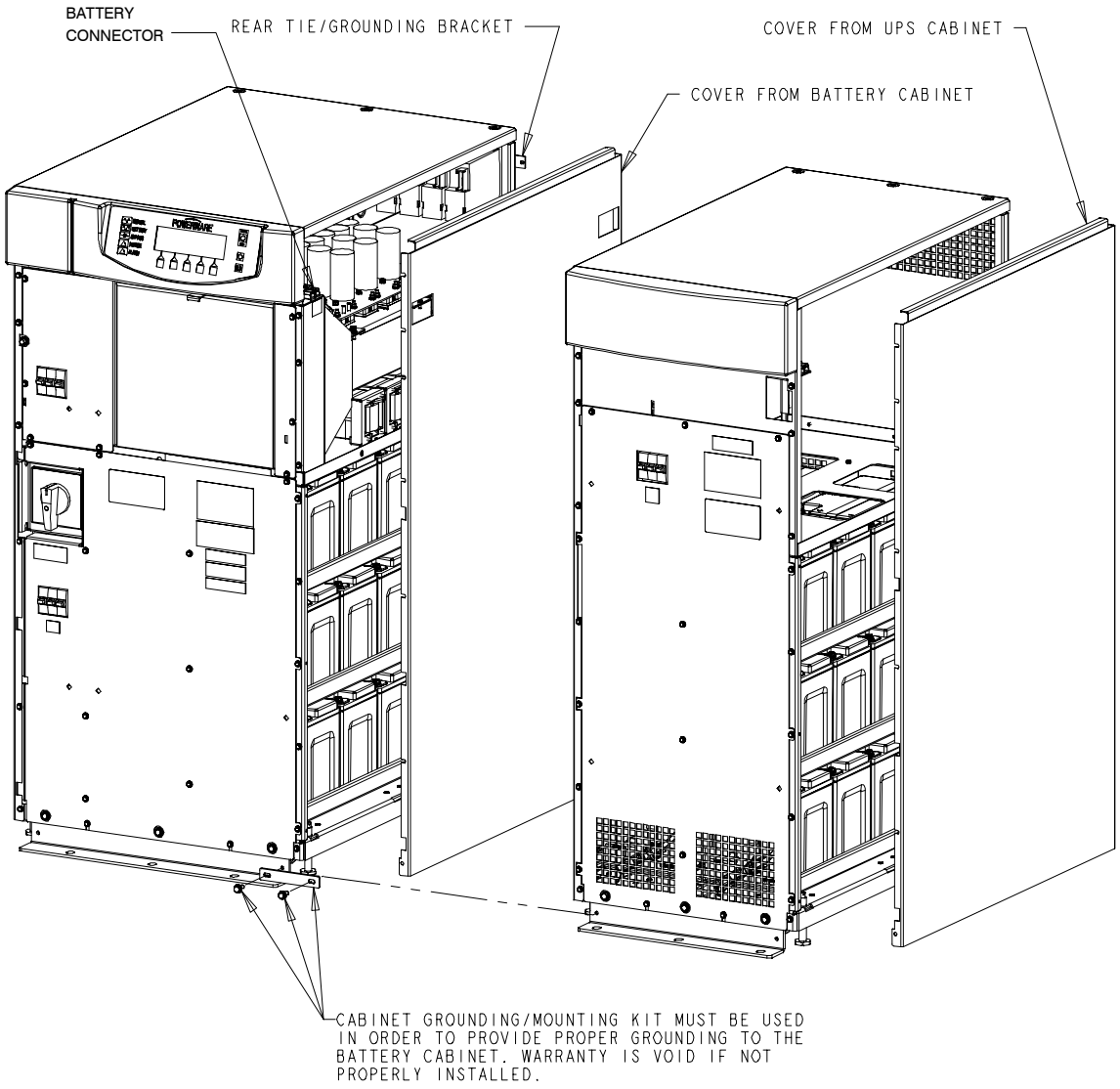

BATTERY
CONNECTOR
REAR TIE/GROUNDING BRACKET
COVER FROM UPS CABINET
COVER FROM BATTERY CABINET
CABINET GROUNDING/MOUNTING KIT MUST BE USED
IN ORDER TO PROVIDE PROPER GROUNDING TO THE
BATTERY CABINET. WARRANTY IS VOID IF NOT
PROPERLY INSTALLED.

Figure 2−6. Battery Cabinet Installation − Powerware 9330 (10 kVA−20 kVA) (Permanent Mounting)

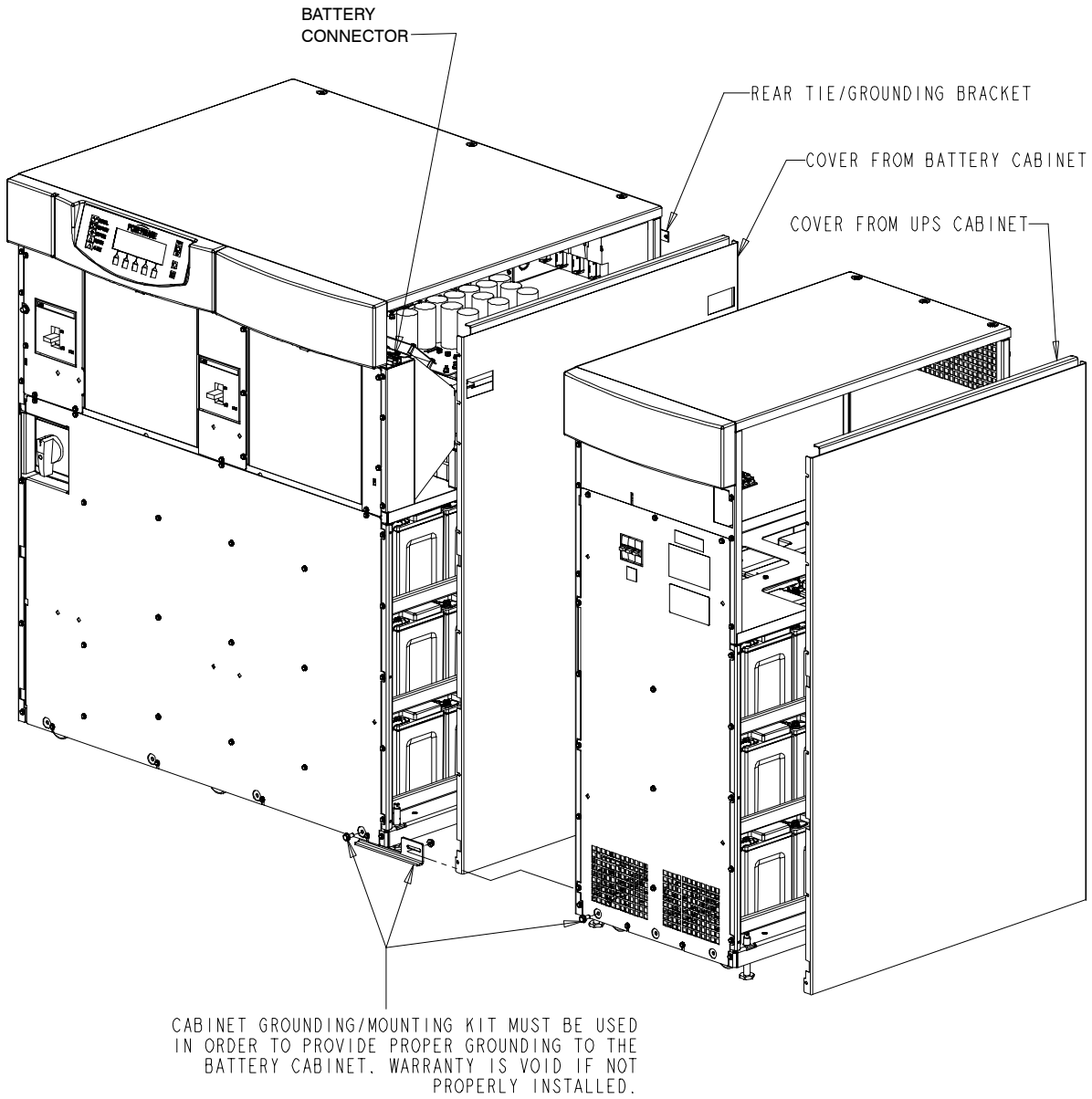

BATTERY
CONNECTOR
REAR TIE/GROUNDING BRACKET
COVER FROM BATTERY CABINET
COVER FROM UPS CABINET
CABINET GROUNDING/MOUNTING KIT MUST BE USED
IN ORDER TO PROVIDE PROPER GROUNDING TO THE
BATTERY CABINET. WARRANTY IS VOID IF NOT
PROPERLY INSTALLED.

Figure 2−7. Battery Cabinet Installation − Powerware 9330 (25 kVA−40 kVA) (Non−Permanent Mounting)

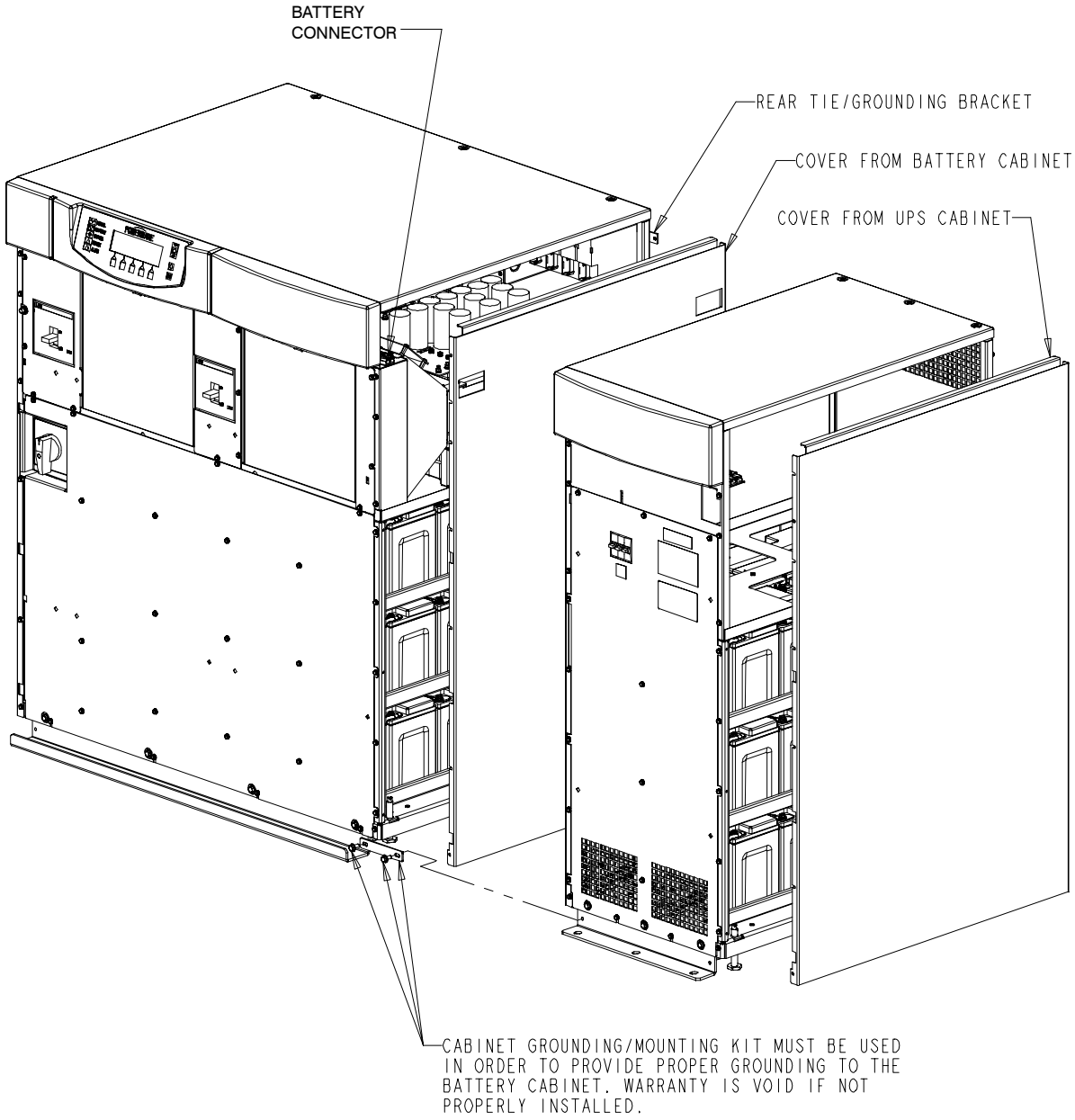

BATTERY
CONNECTOR
REAR TIE/GROUNDING BRACKET
COVER FROM BATTERY CABINET
COVER FROM UPS CABINET
CABINET GROUNDING/MOUNTING KIT MUST BE USED
IN ORDER TO PROVIDE PROPER GROUNDING TO THE
BATTERY CABINET. WARRANTY IS VOID IF NOT
PROPERLY INSTALLED.

Figure 2−8. Battery Cabinet Installation − Powerware 9330 (25 kVA−40 kVA) (Permanent Mounting)

14. Install side panel removed from the UPS cabinet to the right side of the Battery cabinet. Secure with screws removed from Battery cabinet.
15. When all wiring is complete, proceed to Chapter 3 and connect battery strings in accordance with instructions contained in paragraph 3.4.2.
16. Using retained hardware, reinstall shipping brackets previously removed, to front and rear of Battery cabinet with the angle facing outward.(see Figures 2−6 or 2−8).
17. Secure the front of Battery cabinet to the front of the UPS cabinet with the long flat grounding/mounting bracket from the installation kit (see Figures 2−6 or 2−8). Use hardware provided in the kit to secure the bracket.
18. Remove the top side panel mounting screw (tie/grounding bracket location in Figure 2−6) from both the Battery and UPS cabinets.
19. Secure the back of Battery cabinet to the back of the UPS cabinet with the tie/grounding bracket. Secure the bracket with the side panel mounting screws.
20. Install side panel removed from the UPS cabinet to the right side of the Battery cabinet. Secure with screws removed from Battery cabinet.
21. Secure cabinets to floor with contractor supplied hardware.
22. When all wiring is complete, proceed to Chapter 3 and connect battery strings in accordance with instructions contained in paragraph 3.4.2.

2.3.3 Joining Additional Battery Cabinets

To join additional battery cabinets, perform the following steps. Refer to Figure 2−5 for non-permanent installation or Figure 2−6 for permanent installation of the Powerware 9330 (10 kVA−20 kVA) UPS and Figure 2−7 for non-permanent installation or Figure 2−8 for permanent installation of the Powerware 9330 (25 kVA−40 kVA) UPS.

1. Roll the Battery cabinet to a spot near the right side of the previously installed Battery cabinet.
2. Remove front vented panels from the Battery cabinets. The front panels are secured with magnetic latches and are removed by pulling panels straight forward to disengage magnetic latches (see Figure 2−1).
3. Remove right side outside panel from previously installed Battery cabinet. Retain hardware.
4. Remove right side panel from new Battery cabinet. Retain hardware.
5. Install side panel removed from the new Battery cabinet to the right side of the previously installed Battery cabinet. Secure with screws removed from Battery cabinet.
6. Find the battery cable with 2-pole connector in the new Battery cabinet. Route this connector into the previously installed Battery cabinet and mate with the matching connector in the cabinet (see Figures 2−5, 2−6, 2−7, or 2−8).
7. Push the new Battery cabinet against the right side of the previously installed Battery cabinet.

8. If permanently mounting the system, proceed to step 15; otherwise, proceed to step 9.
9. Secure the new Battery cabinet in position by lowering the leveling feet, until cabinet is not resting on the casters and the cabinet is level.
10. Secure the front of Battery cabinets by sliding the angle grounding/mounting bracket, from installation kit, behind the base of the Battery cabinets with the bottom angle facing outward (see Figures 2−5 or 2−7). Use hardware provided in the kit to secure the bracket.
11. Remove the top side panel mounting screw (tie/grounding bracket location in Figures 2−5 or 2−7) from both the Battery cabinets.
12. Secure the back of Battery cabinets with the tie/grounding bracket. Secure the bracket with the side panel mounting screws.
13. Install side panel removed from the previously installed Battery cabinet to the right side of the new Battery cabinet. Secure with screws removed from Battery cabinet.
14. When all wiring is complete, proceed to Chapter 3 and connect battery strings in accordance with instructions contained in paragraph 3.4.2.
15. Using retained hardware, reinstall shipping brackets previously removed to front and rear of new Battery cabinet with the angle facing outward.(see Figures 2−6 or 2−8).
16. Secure the front of Battery cabinets with the long flat grounding/mounting bracket from the installation kit (see Figures 2−6 or 2−8). Use hardware provided in the kit to secure the bracket.
17. Remove the top side panel mounting screw (tie/grounding bracket location in Figures 2−6 or 2−8) from both the Battery cabinets.
18. Secure the back of Battery cabinets with the tie/grounding bracket. Secure the bracket with the side panel mounting screws.
19. Install side panel removed from the previously installed Battery cabinet to the right side of the new Battery cabinet. Secure with screws removed from Battery cabinet.
20. Secure cabinets to floor with contractor supplied hardware.
21. When all wiring is complete, proceed to Chapter 3 and connect battery strings in accordance with instructions contained in paragraph 3.4.2.
22. Repeat steps 1 through 21 to join additional Battery cabinets.

2.4 Options Cabinet Installation

2.4.1 Unloading the Options Cabinet from the Pallet

To remove the Options cabinet from the pallet, refer to paragraph 2.2.1.

2.4.2 Joining the Options Cabinet to the UPS Cabinet

To join the Options cabinets to the UPS, perform the following steps. Refer to Figure 2−9 for non-permanent installation or Figure 2−10 for permanent installation of the Powerware 9330 (10 kVA−20 kVA) UPS and Figure 2−11 for non-permanent installation or Figure 2−12 for permanent installation of the Powerware 9330 (25 kVA−40 kVA) UPS.

NOTE: *The cables used in step 8 are coiled outside the Options cabinet and are attached at the factory to the input and output terminals of the Options cabinet.*

1. Roll the Options cabinet to a spot near the left side of the UPS.
2. Remove left front solid panel, and right front vented panel from the Powerware 9330 (10 kVA−20 kVA) UPS cabinet or left front solid panel and front vented panels from Powerware 9330 (25 kVA−40 kVA) UPS cabinet. Front panels are secured with magnetic latches and are removed by pulling panels straight forward to disengage magnetic latches (see Figure 2−1 or 2−3).
3. Remove screws securing UPS cabinet internal safety shield panel and remove panel to gain access to wireway.
4. Remove front vented panel from Options cabinet. The front panel is secured with magnetic latches and are removed by pulling panels straight forward to disengage magnetic latches.
5. Remove left side outside panel from UPS cabinet. Retain hardware.
6. Remove left side panel from Options cabinet. Retain hardware.
7. Install side panel removed from the Options cabinet to the left side of the UPS cabinet. Secure with screws removed from UPS cabinet.
8. Route the input and output cables from the Options cabinet through cutout in UPS cabinet side to the UPS wireway.
9. Push the Options cabinet against the left side of the UPS cabinet.
10. If permanently mounting the system, proceed to step 16; otherwise, proceed to step 11.
11. Secure the Options cabinet in position by lowering the leveling feet, until cabinet is not resting on the casters and the cabinet is level.
12. Secure the front of Options cabinet to the front of the UPS cabinet by sliding the angle grounding/mounting bracket, from installation kit, behind the base of the Options and UPS cabinets with the bottom angle facing outward (see Figure 2−9 or 2−11). Use hardware provided in the kit to secure the bracket.

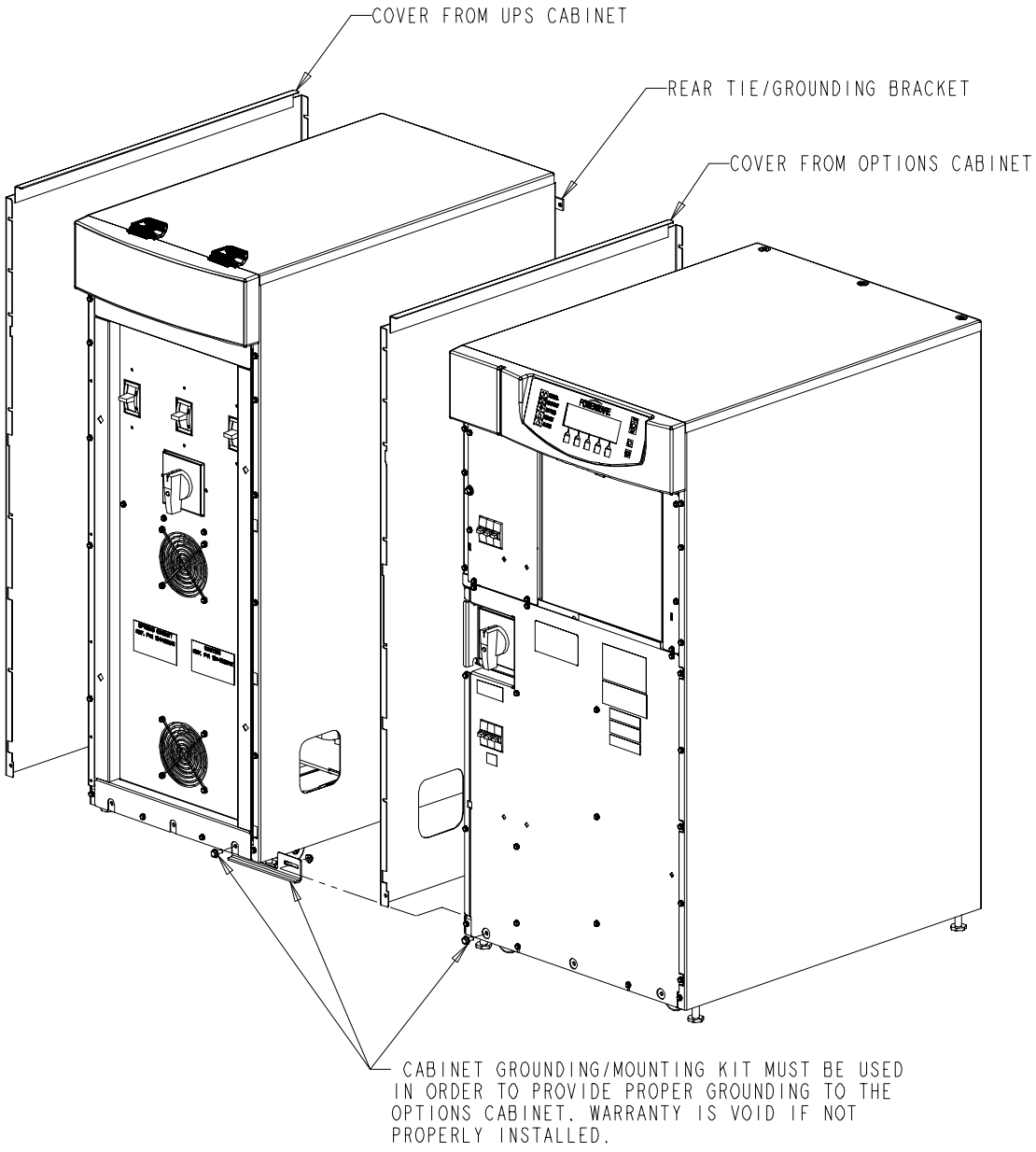

COVER FROM UPS CABINET
REAR TIE/GROUNDING BRACKET
COVER FROM OPTIONS CABINET
CABINET GROUNDING/MOUNTING KIT MUST BE USED IN ORDER TO PROVIDE PROPER GROUNDING TO THE OPTIONS CABINET. WARRANTY IS VOID IF NOT PROPERLY INSTALLED.

Figure 2−9. Options Cabinet Installation − Powerware 9330 (10 kVA−20 kVA) (Non−Permanent Mounting)

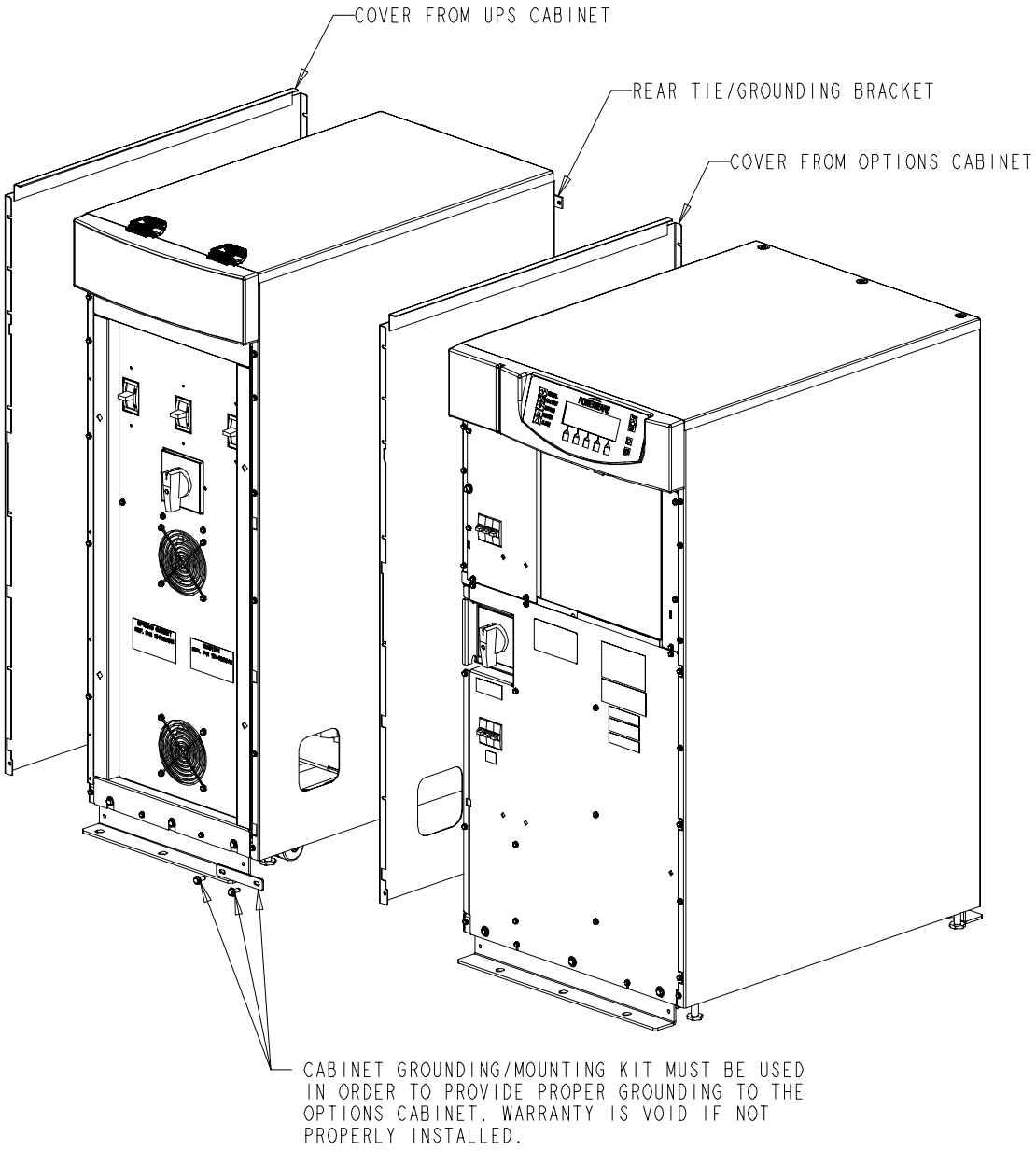

COVER FROM UPS CABINET
REAR TIE/GROUNDING BRACKET
COVER FROM OPTIONS CABINET
CABINET GROUNDING/MOUNTING KIT MUST BE USED IN ORDER TO PROVIDE PROPER GROUNDING TO THE OPTIONS CABINET. WARRANTY IS VOID IF NOT PROPERLY INSTALLED.

Figure 2–10. Options Cabinet Installation – Powerware 9330 (10 kVA–20 kVA) (Permanent Mounting)

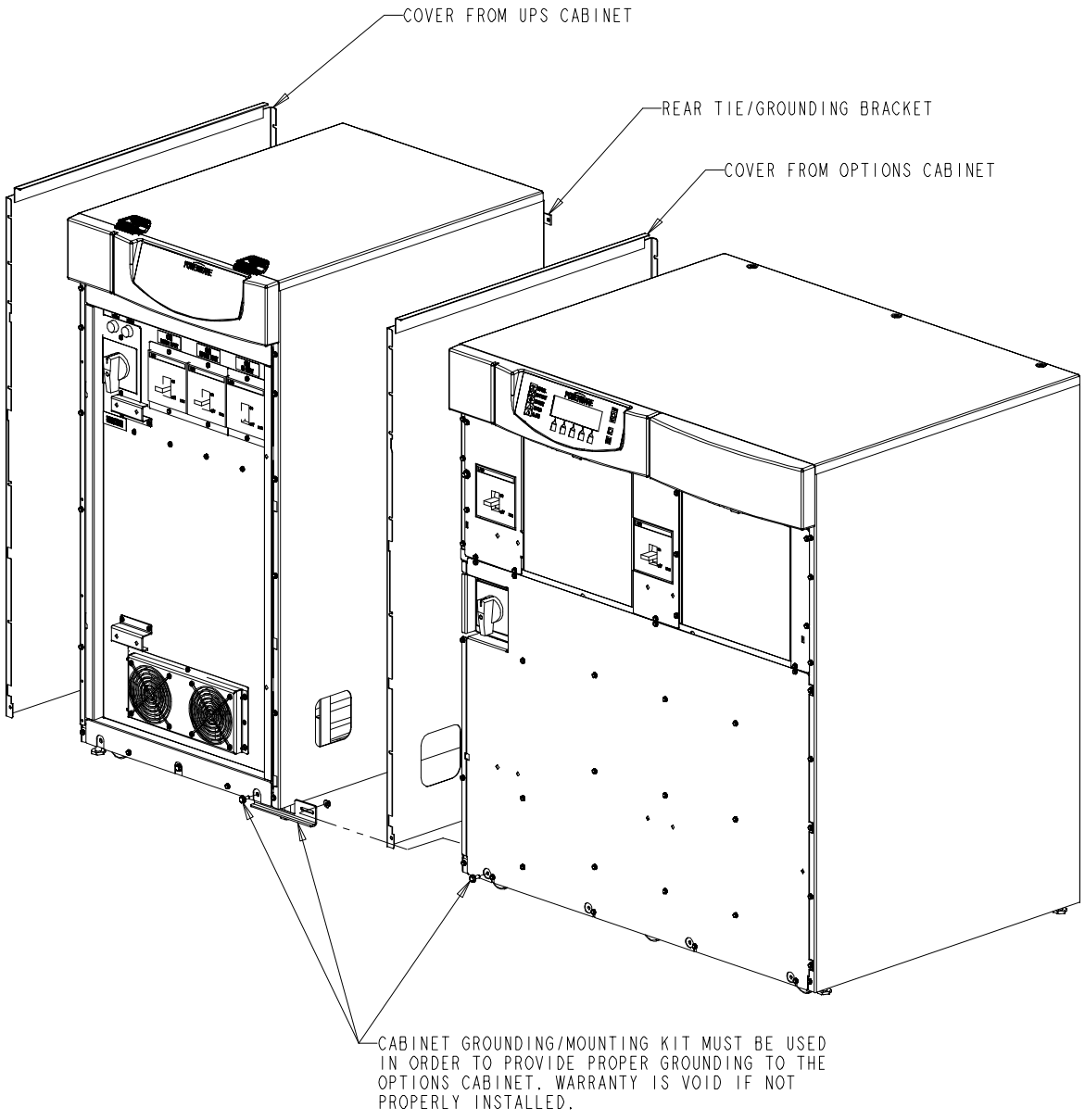

COVER FROM UPS CABINET
REAR TIE/GROUNDING BRACKET
COVER FROM OPTIONS CABINET
CABINET GROUNDING/MOUNTING KIT MUST BE USED IN ORDER TO PROVIDE PROPER GROUNDING TO THE OPTIONS CABINET. WARRANTY IS VOID IF NOT PROPERLY INSTALLED.

Figure 2−11. Options Cabinet Installation − Powerware 9330 (25 kVA−40 kVA) (Non−Permanent Mounting)

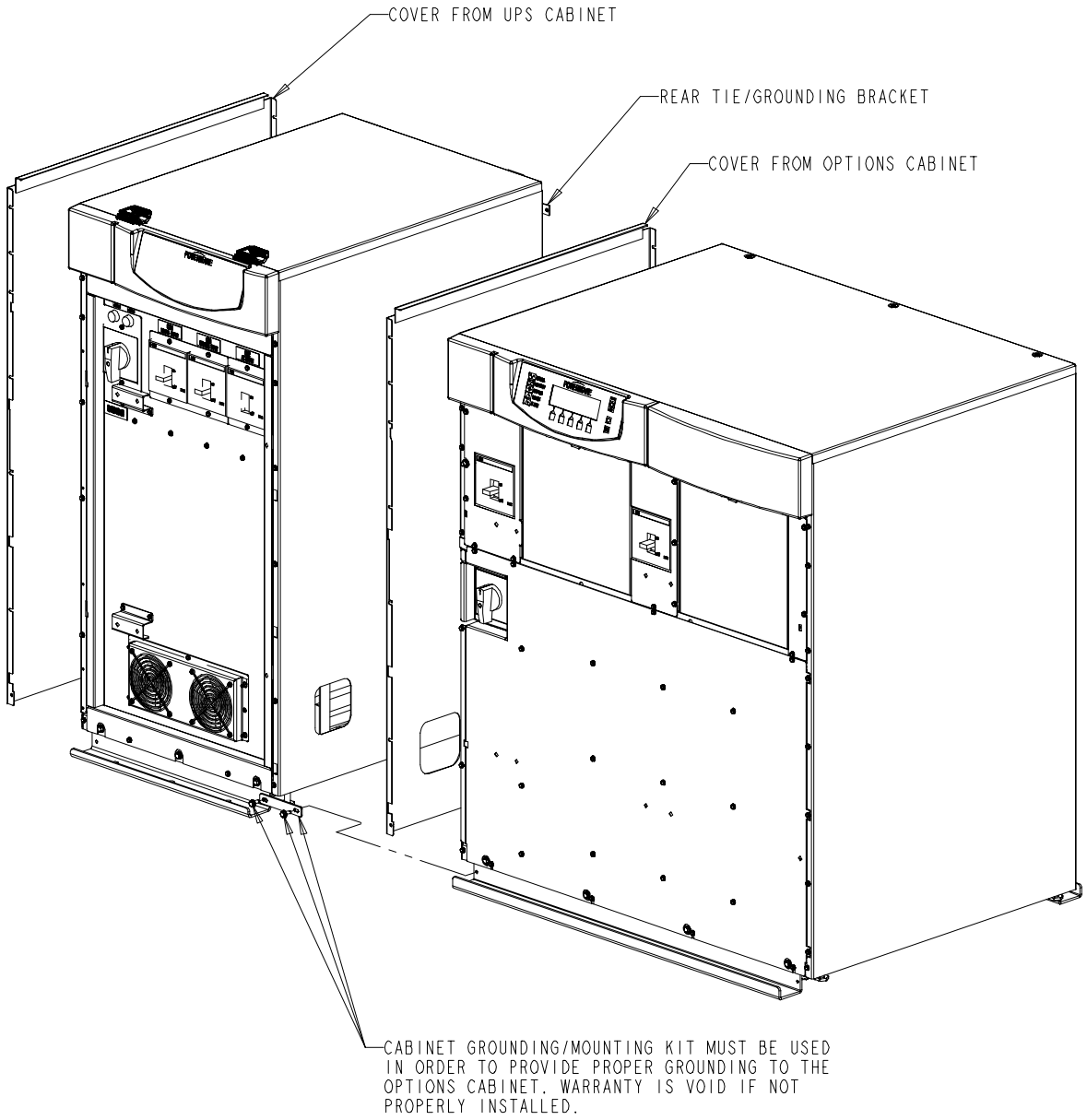

COVER FROM UPS CABINET
REAR TIE/GROUNDING BRACKET
COVER FROM OPTIONS CABINET
CABINET GROUNDING/MOUNTING KIT MUST BE USED IN ORDER TO PROVIDE PROPER GROUNDING TO THE OPTIONS CABINET. WARRANTY IS VOID IF NOT PROPERLY INSTALLED.

Figure 2–12. Options Cabinet Installation – Powerware 9330 (25 kVA–40 kVA) (Permanent Mounting)

13. Remove the top side panel mounting screw (tie/grounding bracket location in Figures 2−9 or 2−11) from both the Option and UPS cabinets.
14. Secure the back of Options cabinet to the back of the UPS cabinet with the tie/grounding bracket. Secure the bracket with the side panel mounting screws.
15. Proceed to paragraph 2.4.3.
16. Using retained hardware, reinstall shipping brackets previously removed to front and rear of Options cabinet with the angle facing outward.(see Figures 2−10 or 2−12).
17. Secure the front of Options cabinet to the front of the UPS cabinet with the long flat grounding/mounting bracket from the installation kit (see Figures 2−10). Use hardware provided in the kit to secure the bracket.
18. Remove the top side panel mounting screw (tie/grounding bracket location in Figure 2−10 or 2−12) from both the Option and UPS cabinets.
19. Secure the back of Options cabinet to the back of the UPS cabinet with the tie/grounding bracket. Secure the bracket with the side panel mounting screws.
20. Secure cabinets to floor with contractor supplied hardware.
21. Proceed to paragraph 2.4.3.

2.4.3 Installing Options Cabinet Internal Power Wiring

1. Remove left front solid panel, and right front vented panel from the Powerware 9330 (10 kVA–20 kVA) UPS cabinet or left front solid panel and front vented panels from Powerware 9330 (25 kVA–40 kVA) UPS cabinet. Front panels are secured with magnetic latches and are removed by pulling panels straight forward to disengage magnetic latches (see Figure 2–1).
2. Remove screws securing UPS internal safety shield panel and remove panel to gain access to input and output terminals.
3. Route input and output cables from Options cabinet through wireway to UPS terminal blocks. Refer to Appendix A of this manual for wiring access information.
4. If wiring a single feed system, proceed to step 5; if wiring a dual feed system, proceed to step 7.
5. Connect phase A, B, C, and Neutral rectifier and bypass input power wiring from the Options cabinet to the bypass input terminals in the UPS cabinet. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information. Note wiring connections for single feed systems.
6. Proceed to step 10.
7. Disconnect single feed jumpers from phase A, B, and C terminals on Input Breaker CB1 and Input Terminal strip TB2 in UPS cabinet. Remove jumpers from cabinet.
8. Connect phase A, B, and C mains input power wiring from Options cabinet to the rectifier input terminals on Input Breaker CB1 in the UPS cabinet. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information. Note wiring connections for dual feed systems.
9. Connect phase A, B, C, and Neutral bypass input power wiring from Options cabinet to the bypass input terminals on Input Terminal strip TB2 in the UPS cabinet. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information. Note wiring connections for dual feed systems.
10. Connect phase A, B, and C and Neutral output power wiring from the Options cabinet to the output terminals in the UPS cabinet. Refer to Appendix A of this manual for termination requirements and wiring access information.
11. Secure the UPS by reinstalling safety shield panels, front vented panels, and front solid panel.

2.4.4 Installing Options Cabinet External Power Wiring

NOTE: *Remove Options cabinet input and output conduit landing plate to punch conduit holes.*

1. Route input and output cables to input/output terminal block. Refer to Appendix A of this manual for wiring access information.
2. If optional Power Distribution Module (PDM) is installed in the Options cabinet, proceed to step 10; otherwise, proceed to step 3.
3. If wiring a single feed system, proceed to step 4; if wiring a dual feed system, proceed to step 6.
4. Connect phase A, B, C, and Neutral mains and bypass input power wiring from source to the bypass input terminals in the Options cabinet. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information. Note wiring connections for single feed systems.
5. Proceed to step 8.
6. Connect phase A, B, and C mains input power wiring from source to the mains input terminals in the Options cabinet. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information. Note wiring connections for dual feed systems.
7. Connect phase A, B, C, and Neutral bypass input power wiring from source to the bypass input terminals in the Options cabinet. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information. Note wiring connections for dual feed systems.
8. Connect phase A, B, and C and Neutral output power wiring from output terminals to critical load. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information.
9. Proceed to step 17.
10. If wiring a single feed system, proceed to step 11; if wiring a dual feed system, proceed to step 13.
11. Connect phase A, B, C, and Neutral mains and bypass input power wiring from source to the bypass input terminals in the Options cabinet. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information. Note wiring connections for single feed systems.
12. Proceed to step 15.
13. Connect phase A, B, and C mains input power wiring from source to the mains input terminals in the Options cabinet. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information. Note wiring connections for dual feed systems.
14. Connect phase A, B, C, and Neutral bypass input power wiring from source to the bypass input terminals in the Options cabinet. Refer to Appendix A of this manual for wiring and termination requirements and wiring access information. Note wiring connections for dual feed systems.

NOTE: *Remove Options cabinet PDM conduit landing plate to punch conduit holes.*

15. Install Square-D Type QO or QOB breakers into PDM panelboard. Refer to Appendix A of this manual for access information.

16. Wire branch circuits in accordance with branch circuit breaker manufacturers instructions (output from the UPS or Options cabinet is prewired to the PDM). Refer to Appendix A of this manual wiring access information.

17. After wiring the Options cabinet to the facility power and critical load, be sure to ground the system according to local and/or national electrical wiring codes.

18. When all wiring is complete, connect battery strings in accordance with instructions contained in paragraphs 3.4.1 and 3.4.2 of Chapter 3.

19. Secure the UPS by reinstalling safety shield panels, front vented panels, and front solid panel.

20. Install side panel removed from the UPS cabinet to the left side of the Options cabinet.

21. Secure the Options cabinet by reinstalling front vented panel.

2.5 Initial Startup

Startup and operational checks should be performed only by authorized service personnel. Contact service in advance (usually a two week notice is required) to reserve a preferred startup date.

2.6 Completing the Installation Checklist

The final step in installing your UPS system is completing the following Installation Checklist. This checklist ensures that you have completely installed all hardware, cables, and other equipment. Completing all items listed on the checklist will ensure a smooth installation. You should make a copy of the Installation Checklist before filling it out, and retain the original.

After your installation is complete, a service representative will be able to verify the operation of your UPS system and commission it to support your critical load. The service representative cannot perform any installation tasks other than verifying software and operating setup parameters. Service personnel may request a copy of the completed Installation Checklist to be sure you have completed all applicable equipment installation.

NOTE: *The Installation Checklist MUST be completed prior to starting the* UPS *system for the first time.*

2.6.1 Installation Checklist

- ❑ All packing materials and restraints have been removed from each cabinet.
- ❑ Each cabinet in the UPS system is placed in its installed location.
- ❑ A cabinet grounding/mounting kit is installed between any cabinets that are bolted together.
- ❑ All conduits, and cables are properly routed to the UPS and auxiliary cabinets.
- ❑ All power cables are properly sized and terminated.
- ❑ The bypass source of the supply is a four wire wye configuration. If using dual feed, the rectifier source is a three wire connection from a wye configuration.
- ❑ All telephone and network connections have been completed.
- ❑ A ground conductor is properly installed.
- ❑ Internal battery cabinet connections have been completed (plugs, etc.).
- ❑ Air conditioning equipment is installed and operating correctly.
- ❑ The area around the installed UPS system is clean and dust-free. (It is recommended that the UPS be installed on a level floor suitable for computer or electronic equipment.)
- ❑ Adequate workspace exists around the UPS and other cabinets.
- ❑ Adequate lighting is provided around all UPS equipment.
- ❑ A 120V service outlet is located within 25 feet of the UPS equipment.
- ❑ The Remote Emergency Power Off (EPO) device is mounted in its installed location and its wiring terminated inside the UPS cabinet.
- ❑ Summary alarms and/or building alarms are wired appropriately. (OPTIONAL)
- ❑ Startup and operational checks performed by authorized service personnel.

Notes

Installing and Connecting Batteries 3

3.1 Important Safety Instructions

This chapter describes installing the UPS batteries.

The installation of batteries should be performed or supervised by personnel knowledgeable of batteries and their associated precautions. Keep unauthorized personnel away from batteries.

Observe these precautions when working on or around batteries:

- Remove watches, rings, or other metal objects.
- Use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of batteries.
- Disconnect the charging source prior to connecting or disconnecting terminals.
- Determine if the battery is inadvertently grounded. If it is, remove the source of the ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock is reduced if such grounds are removed during installation and maintenance.
- When replacing batteries, use the same number and type.
- Proper disposal of batteries is required. Refer to your local codes for disposal requirements.

WARNING:
Do not dispose of battery or batteries in a fire. The battery may explode.

Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes, and may be toxic.

A battery can cause electrical shock, burn from high short-circuit current, or fire. Take proper precautions when working with batteries.

ATTENTION:
Une batterie peut prêsenter un risque de choc êlectrique, de brulure, ou d'incendie. Suivre les précautions qui s'imposent.

- Pour le remplacement, utiliser le même nombre et modéle des batteries.
- L'élimination des batteries est règlementée. Consulter les codes locaux à cet effet.

3.2 Battery Type

The following battery types are supplied in the UPS Cabinets and external Battery Cabinets. When purchasing UPS Cabinets or external Battery Cabinets without batteries, only the following types are recommended. Use of any other battery type inside Powerware cabinets will void the product warranty.

Battery Manufacturer	Yuasa, Inc.	Powersonic/Enersys
Battery Model	NPX–100R or NPX–100B	12GAX105
Battery Quantity Powerware 9330 (10 kVA–20 kVA) Powerware 9330 (25 kVA–40 kVA)	 24 48	 24 48

3.3 Battery Installation

3.3.1 Installing Internal Batteries in the UPS Cabinet

If the UPS cabinet was ordered without batteries, install the batteries in accordance with the following procedure.

WARNING:
LETHAL VOLTAGE WILL BE PRESENT WHEN PERFORMING THE STEPS IN THIS SECTION.

1. Ensure that battery breaker CB2 is in the OFF position. If not, set breaker to OFF position.
2. Remove left front solid panel and right front vented panel from Powerware 9330 (10 kVA–20 kVA) UPS or left front solid panel and front vented panels from Powerware 9330 (25 kVA–40 kVA) UPS. Front panels are secured with magnetic latches and are removed by pulling panels straight forward to disengage magnetic latches.
3. Remove screws securing internal safety shield panels and remove panels to gain access to battery trays.
4. Remove battery trays, containing wiring and nylon straps, from the UPS cabinet.
5. Select batteries in a accordance with paragraph 3.2. Use batteries of the same age, type, and manufacturer, in each string, so UPS performance is not affected.
6. Install four batteries per tray and electrically interconnect the batteries in accordance with Figure 3–1 or 3–2.
7. Secure batteries to tray using nylon straps.
8. Reinstall battery trays into the UPS cabinet.
9. Connect battery strings in accordance with paragraph 3.4.1.

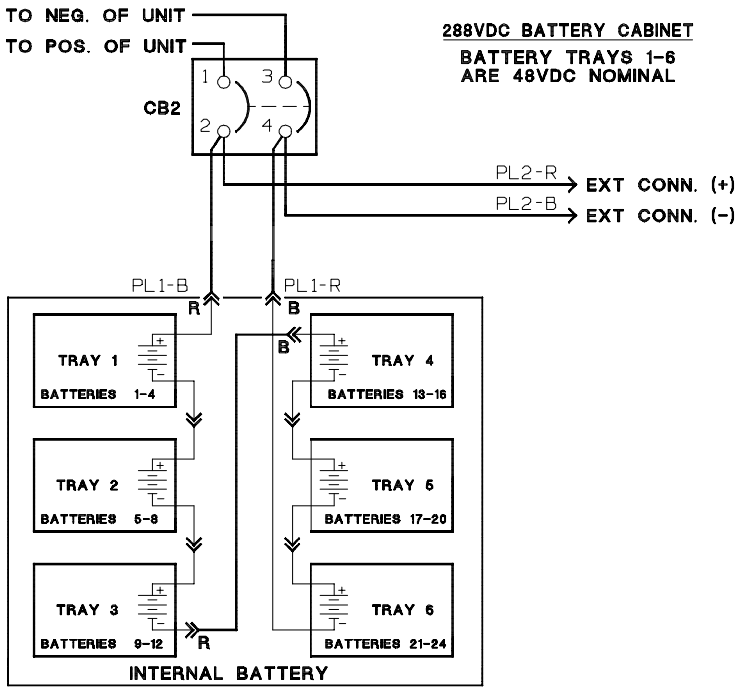


Figure 3–1. Battery Schematic – Powerware 9330 (10 kVA–20 kVA) UPS and Battery Cabinet

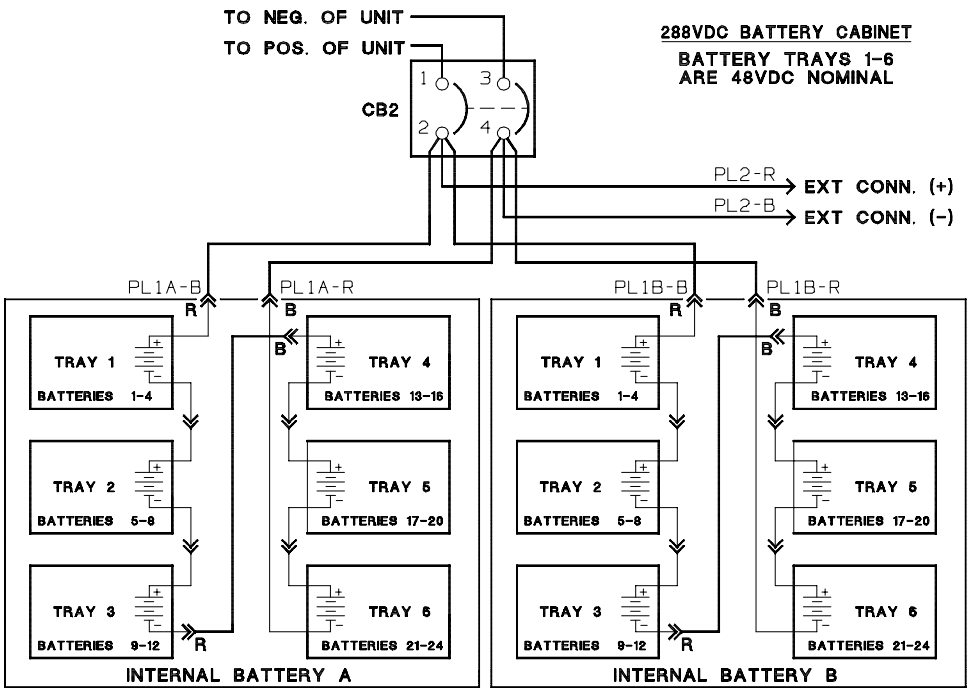


Figure 3–2. Battery Schematic – Powerware 9330 (25 kVA–40 kVA) UPS

3.3.2 Installing Internal Batteries in the Battery Cabinet

If the battery cabinet was ordered without batteries, install the batteries in accordance with the following procedure.

WARNING:
LETHAL VOLTAGE WILL BE PRESENT WHEN PERFORMING THE STEPS IN THIS SECTION.

1. Ensure that battery breaker is in the OFF position. If not, set breaker to OFF position.
2. Remove front vented panel from battery cabinet. The front panel is secured with magnetic latches and is removed by pulling panel straight forward to disengage magnetic latches.
3. Remove screws securing internal safety shield panel and remove panel to gain access to battery trays.
4. Remove battery trays, containing wiring and nylon straps, from the UPS cabinet.
5. Select batteries in a accordance with paragraph 3.2. Use batteries of the same age, type, and manufacturer, in each string, so UPS performance is not affected.
6. Install four batteries per tray and electrically interconnect the batteries in accordance with Figure 3−1.
7. Secure batteries to tray using nylon straps.
8. Reinstall battery trays into the UPS cabinet.
9. Connect battery strings in accordance with paragraph 3.4.2.

3.4 Connecting Batteries

3.4.1 Electrically Connecting Integral Battery Strings

The UPS cabinet is shipped with each internal battery connection string electrically disconnected. Connect the battery strings in accordance with the following procedure:

WARNING:
LETHAL VOLTAGE WILL BE PRESENT WHEN PERFORMING THE STEPS IN THIS SECTION.

1. Ensure that battery breaker CB2 is in the OFF position. If not, set breaker to OFF position.
2. Remove left front solid panel and right front vented panel from Powerware 9330 (10 kVA−20 kVA) UPS or left front solid panel and front vented panels from Powerware 9330 (25 kVA−40 kVA) UPS. Front panels are secured with magnetic latches and are removed by pulling panels straight forward to disengage magnetic latches.

3. Remove screws securing internal safety shield panels and remove panels to gain access to batteries.
4. Connect the string of battery trays together by mating the loose red connector from each tray to the fixed black connector mounted on the front edge of the tray above it (see Figures 3−1 and 3−3 or 3−2 and 3−3).
5. Connect the pigtail battery connectors at the top battery trays as shown in Figure 3−3.
6. Secure the UPS by reinstalling safety shield panels, front vented panels, and left front solid panel.

3.4.2 Electrically Connecting Battery Cabinet Battery Strings

The battery cabinets are shipped with each internal battery connection string electrically disconnected. Connect the battery strings in accordance with the following procedure:

WARNING:
LETHAL VOLTAGE WILL BE PRESENT WHEN PERFORMING THE STEPS IN THIS SECTION.

1. Ensure that battery breaker is in the OFF position. If not, set breaker to OFF position.
2. Remove the front vented panel from battery cabinet. The front panel is secured with magnetic latches and is removed by pulling panel straight forward to disengage magnetic latches.
3. Remove screws securing internal safety shield panel and remove panel to gain access to batteries.
4. Connect the string of battery trays together by mating the loose red connector from each tray to the fixed black connector mounted on the front edge of the tray above it (see Figure 3−3).
5. Connect the pigtail battery connectors at the top battery trays as shown in Figure 3−3.
6. Secure the Battery Cabinet by reinstalling safety shield panel, and front vented panel.
7. If you are installing more than one battery cabinet, perform Steps 1 through 6 for each cabinet.

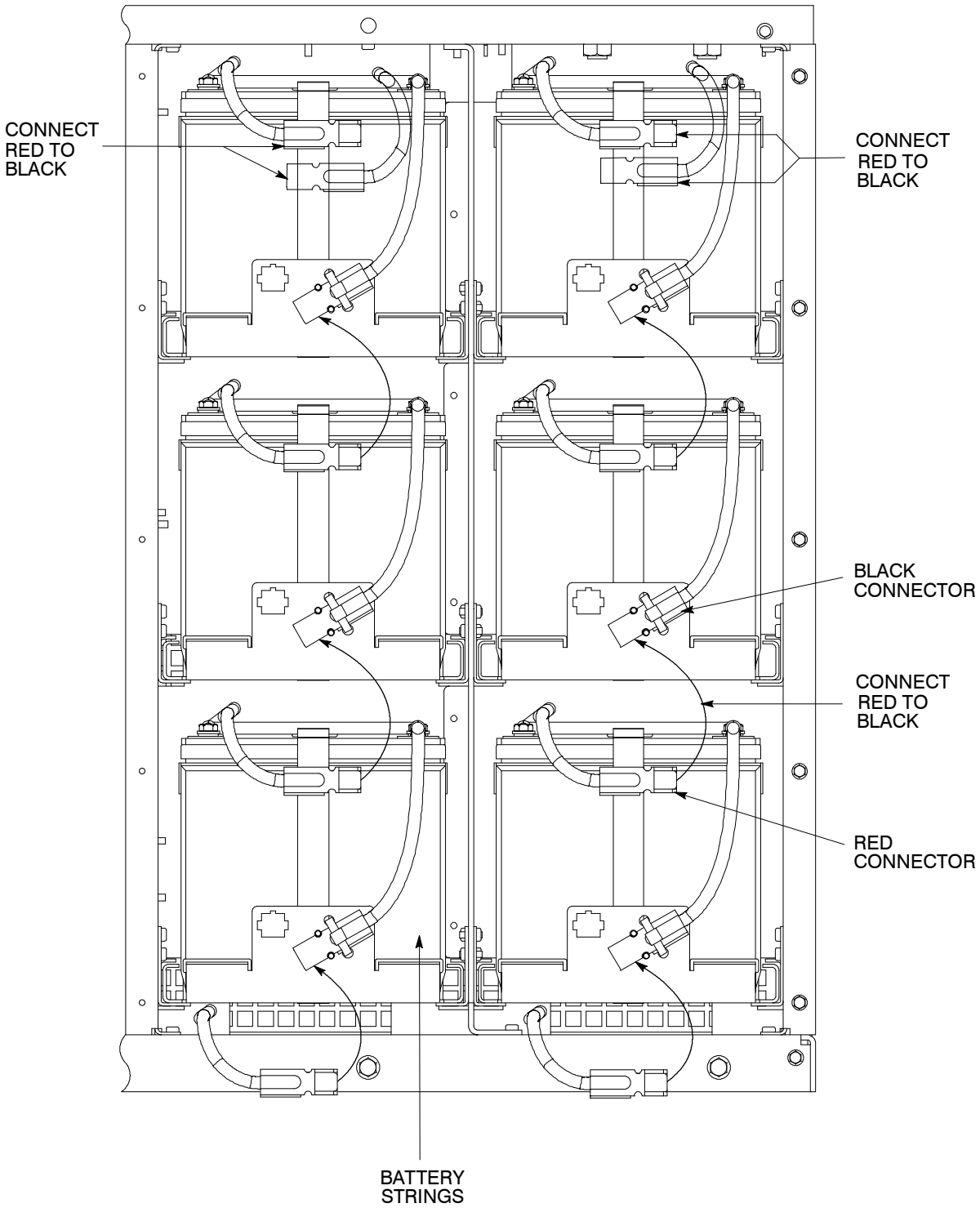


Figure 3−3. Battery String Connection

3.5 Installing and Connecting Remote Battery System

Install and connect remote Battery System as follows:

> CAUTION:
> When sizing battery system, do not exceed internal battery charger capabilities. Refer to Chapter 15 *"Specifications"*, for maximum battery charger currents.

1. Install battery system in accordance with battery and rack manufactures instructions.
2. Install DC disconnect device between battery system and UPS Cabinet.
3. Connect battery system to UPS cabinets (refer to Paragraph 2.2.3 or 2.2.4).

Installing a Remote Emergency Power Off (EPO) Control

4

4.1 Installation Procedures

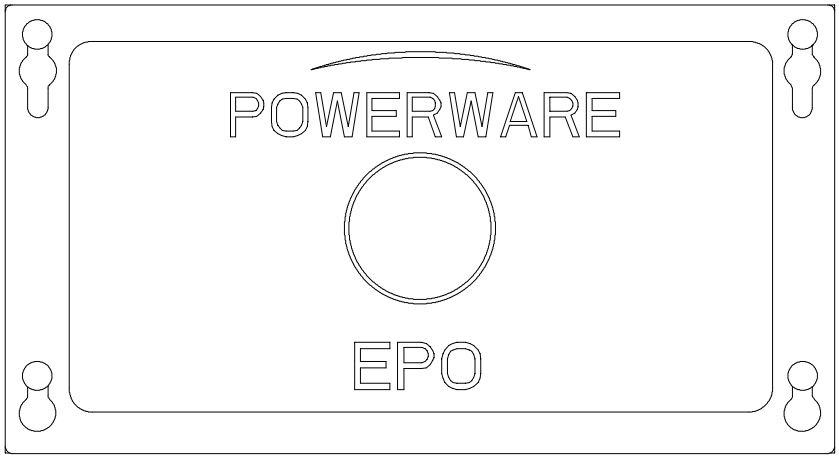


Figure 4–1. Remote EPO Control

4.2 To install a Remote EPO:

NOTE: *Before installing a Remote EPO, be sure you have prepared the UPS according to the instructions in Chapter 2.*

To install a Remote EPO control:

1. Remove cover (see Figure 4–2) from Remote EPO switch enclosure bottom.

NOTE: *If mounting to a hollow wall, secure the enclosure bottom to a wood or metal stud within the wall. Do not use hollow wall anchors.*

2. Securely mount the Remote EPO switch enclosure bottom. Recommended locations include operator's consoles or by exit doors. Refer to Appendix A, Drawing 164201300–18, for enclosure dimensions and wiring knockouts.

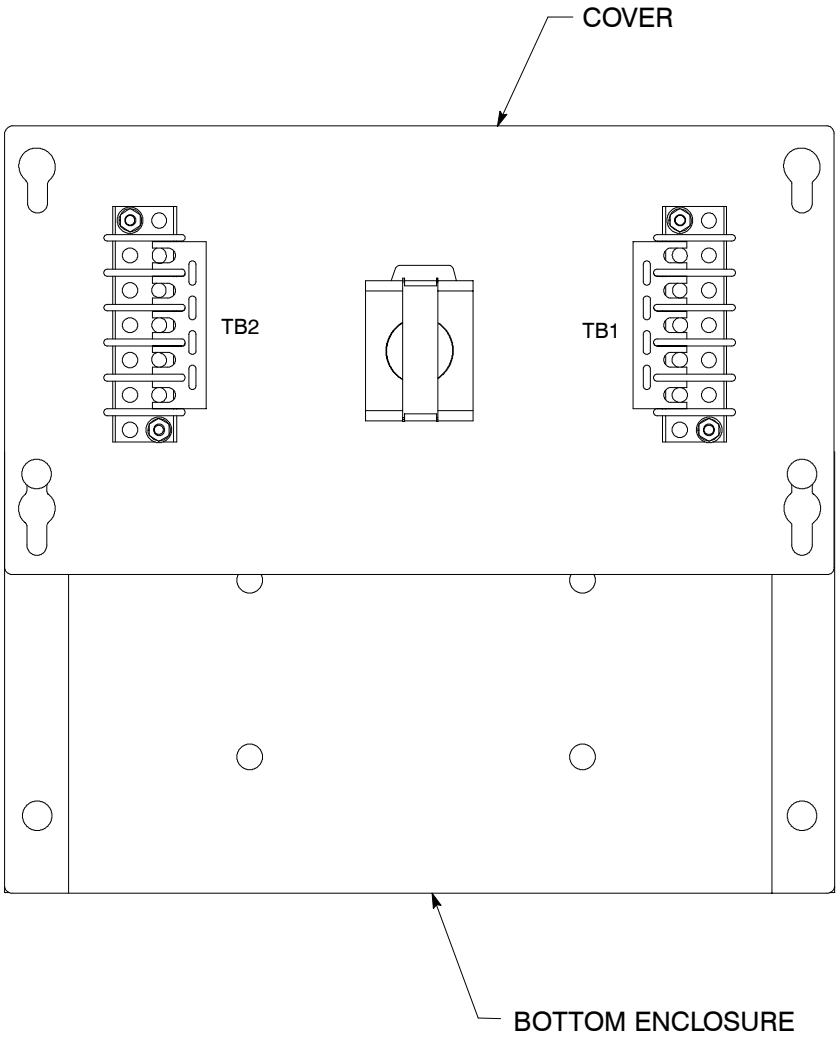


Figure 4−2. Remote EPO Control (inside view of cover and bottom of enclosure)

3. Mount cover to Remote EPO switch enclosure bottom, as shown in Figure 4−2, for easier wiring.

NOTE: *A separate conduit is required for each UPS connected to the Remote EPO switch.*

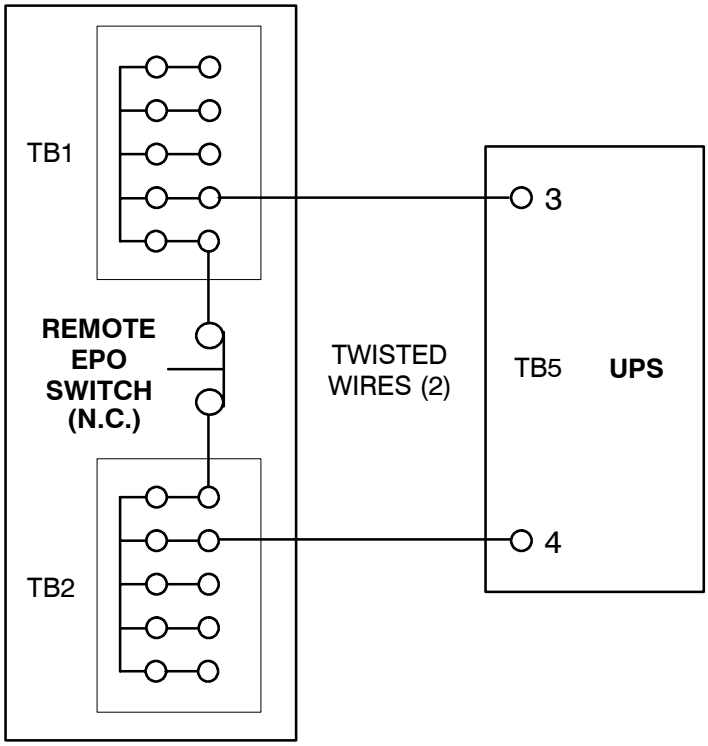
4. Install wiring from the Remote EPO switch using ½-in. conduit through the Customer Interface conduit landing plate on the rear of the UPS cabinet. Refer to Appendix A, Drawing 164201300−8, for conduit landing area and terminal board location, and Drawing 164201300−2 for terminal wiring assignments.

5. Connect the Remote EPO wiring as shown in Tables 4−1 and 4−2 and Figure 4−2.

6. If you are installing multiple Remote EPO stations, wire additional stations in series with the first Remote EPO.

Table 4–1. Remote EPO Wire Terminations		
From Remote EPO Switch(s)	*To Communications Server Board TB5 in UPS Cabinet*	*Remarks*
TB1 Use any open Terminal	TB5–3	Twisted wires (2) 14–18 gauge
TB2 Use any open Terminal	TB5–4	

Table 4–2. Remote EPO



Remote EPO switch rating is 24 VDC, 1 Amp minimum.

NOTE: This switch must be a dedicated switch not tied into any other circuits.

7. If required, install ½-in. conduit and wiring from the Remote EPO switch to trip circuitry of upstream protective devices. A separate contact block, with the appropriate normally open or normally closed contacts, must be used for this function. Remote EPO switch wiring must be in accordance with UL Class 1 requirements.
8. When wiring is complete, remove cover from Remote EPO switch enclosure bottom. Turn cover over and secure to enclosure bottom.
9. Secure the UPS by reversing all steps taken to prepare it for Remote EPO installation.

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Installing a Remote Monitor Panel

5

5.1 Installation Procedures

As an option, you can install a Remote Monitor Panel (RMP) to monitor the operation of the UPS system from virtually any location within your facility, up to 500 feet from the UPS. You can surface-mount an RMP on a desktop or secure it to a wall. Figure 5−1 shows an RMP. Drawing 164201300−19 in Appendix A shows the enclosure dimensions and cable exit openings.

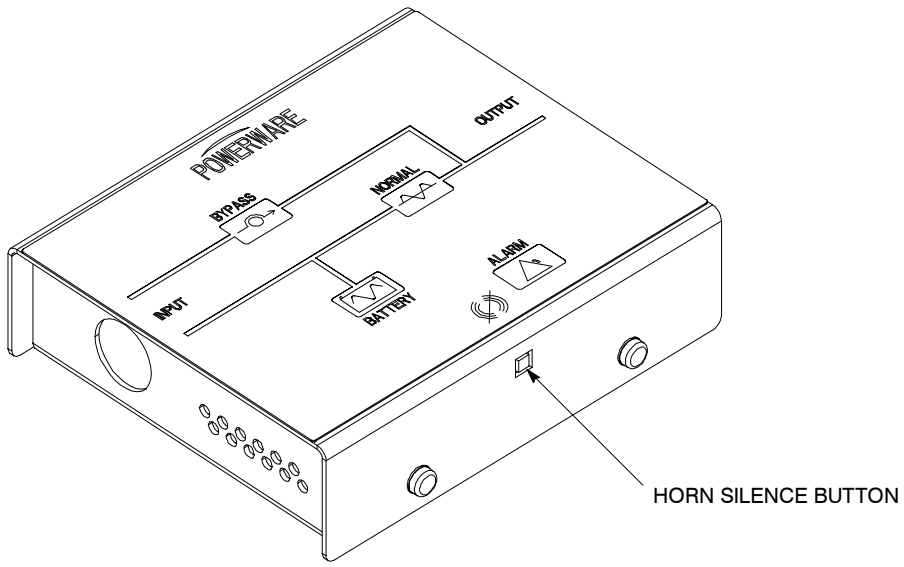


Figure 5−1. Remote Monitor Panel (RMP)

5.2 To install an RMP:

NOTE: *1. Before installing an RMP, be sure you have prepared the UPS according to the instructions in paragraph 2.2.7.*

2. If mounting to a hollow wall, secure the enclosure bottom to a wood or metal stud within the wall. Do not use hollow wall anchors. The RMP also has provisions to be mounted to a single or double gang wall electrical box.

1. If wall mounting, securely mount the RMP. If desk mounting, install provided bumpers to the bottom of the RMP enclosure.
2. Install the Remote Monitor Card into an open x−slot on the rear panel of the UPS Cabinet, using supplied hardware.
3. If wall mounting, proceed to step 4; if desk mounting, proceed to step 5.
4. Install wiring from the RMP to the UPS using ½-in. conduit through the cable exit openings in the Remote Monitor Card (see Figure 5−2) and the RMP (refer to Drawing 164201300−19 in Appendix A). Proceed to step 6.
5. Install wiring from the RMP to the UPS using cable listed in Table 5−1 and provided strain relief bushings in the cable exit openings in the Remote Monitor Card (see Figure 5−2) and the RMP (refer to Drawing 164201300−19 in Appendix A).
6. Connect wiring between the RMP and the UPS Remote Monitor Card plug-in terminal blocks using terminations shown in Table 5−1. See Figures 5−2 and 5−3 for plug-in terminal block locations.

Table 5−1. RMP Wire Terminations

From RMP	*To UPS Remote Monitor Card*	*Remarks*
J1−1	J1−1	Use Belden 8690 060 or equivalent Cable
J1−3	J1−3	
J1−4	J1−4	
J1−5	J1−5	
J1−6	J1−6	

7. To check the operation of the RMP, ensure that the UPS system is supplying the load via the inverter or bypass. If the indicators on the RMP show the appropriate status, then it is operating correctly.

   If the RMP is not operating correctly, check the wiring, the fuse on the Remote Monitor Card, and the plug-in terminal blocks for proper seating. If all connections are secure but the RMP still does not operate correctly, replace the fuse. If this does not correct the problem, contact your local field service office for verification that the RMP is working correctly.

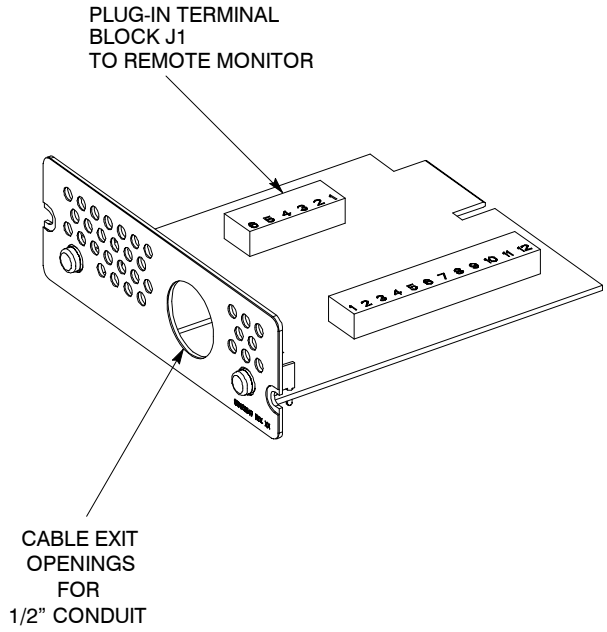
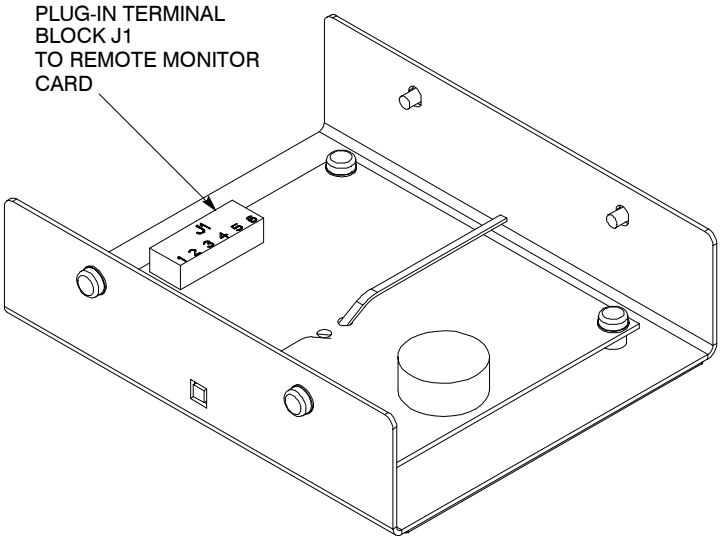


Figure 5–2. Remote Monitor Card



CONDUIT AND WIRING SUPPLIED BY THE CUSTOMER. THE MAXIMUM DISTANCE BETWEEN THE REMOTE MONITOR AND THE UPS IS NOT TO EXCEED 500 FEET.

Figure 5–3. Remote Monitor Panel (RMP) – Top Internal View

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Section II

Operation

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Understanding UPS Operation

6

6.1 Looking Inside the UPS System

The Powerware 9330 is a continuous duty, solid-state, transformerless (at 208 VAC), three phase, true online system that provide conditioned and uninterruptible AC power to the UPS systems output. The UPS supports process control, data processing, telecommunications/PBX, research, and non–patient medical equipment. The Powerware 9330 maintains power to the critical loads during commercial electrical power brownout, blackout, overvoltage, undervoltage, and out-of-tolerance frequency conditions.

The basic system consists of a rectifier, battery charger, DC booster, inverter, monitoring/operation control panel, integrated communications server, and microprocessor controlled (DSP) logic.

In this manual, the power required by your equipment is called the *critical load*. The UPS supplies the critical load with conditioned power that is synchronized with your utility power. Figure 6–1 shows the main elements of the UPS.

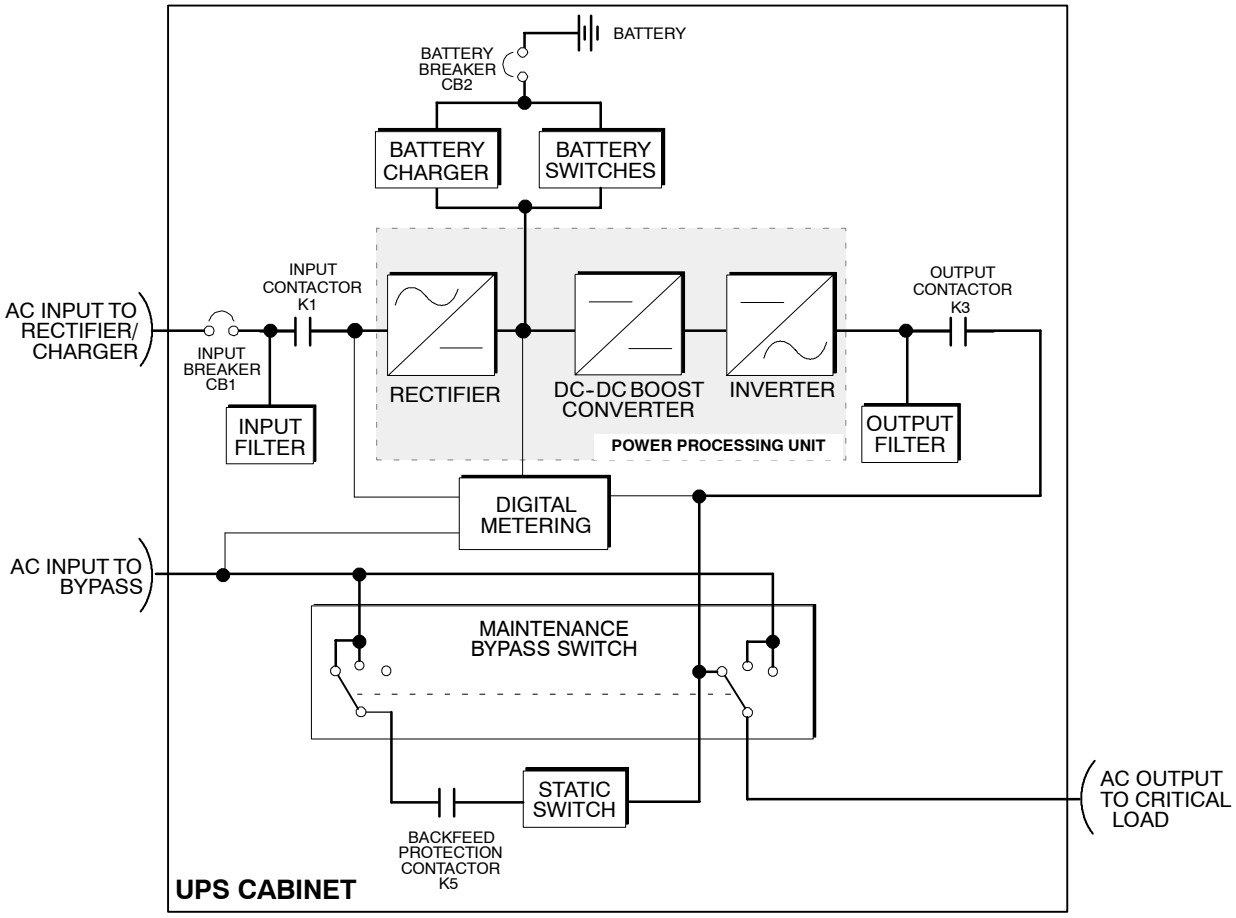

Figure 6–1. Main Elements of the UPS System

If utility power is interrupted or falls outside the parameters specified in Chapter 15, “Product Specifications,” the UPS uses a *backup battery supply* to maintain power to the critical load for a specified period of time or until the utility power returns. For extended power outages, the UPS allows you to either transfer to an alternative power system (such as a generator) or shut down your critical load in an orderly manner.

The emergency bypass consist of a continuous duty static switch, and backfeed protection contactor (K5). The backfeed protection contactor is located in series with the static switch. For manual transfers to bypass, the static switch is also used. The static switch is armed and ready during both types of transfers.

A wraparound Maintenance Bypass switch provides a means of isolating the UPS Power Processsing Unit (PPU) for servicing, while still suppling power to the critical load.

The operation of the UPS system is described in greater detail in the following paragraphs.

6.2 UPS Modes

The UPS system functions automatically to supply AC electrical power to the critical load. There are four standard operation modes:

- In Normal mode, the critical load is supplied by the inverter, which derives its power from rectified utility AC power. In this mode, the battery charger also provides charging current for the battery, if needed.
- In Battery mode, the battery provides DC power, which maintains inverter operation. The battery supports the critical load.
- In Bypass and High Efficiency mode, the critical load is directly supported by utility power.
- In Maintenance Bypass mode, the critical load is directly supported by utility power, but the UPS can be shut down for maintenance. This is accomplished by the operator moving the Maintenance Bypass Switch to Bypass.

The UPS continually monitors itself and the incoming utility power, and automatically switches between these modes as required, with no operator intervention, except for the Maintenance Bypass mode. The sophisticated detection and switching logic inside the UPS ensures that operating mode changes are automatic and transparent to the critical load. The UPS switches operating modes in response to these *system events*:

- A *command* is an intervention that is externally initiated by an operator or by some site action. A command causes the UPS to switch operating modes; it usually does not require any further action by you.
- A *notice* is a minor system event that may or may not require your attention.
- An *alarm* is a system event that requires immediate operator intervention.

System events, alarm horns, and indicator lights are described in Chapter 11, “Responding to System Events.”

The following descriptions provide the differences in UPS operating modes.

6.2.1 Normal Mode

Figure 6−2 shows the path of electrical power through the UPS system when the UPS is operating in Normal mode.

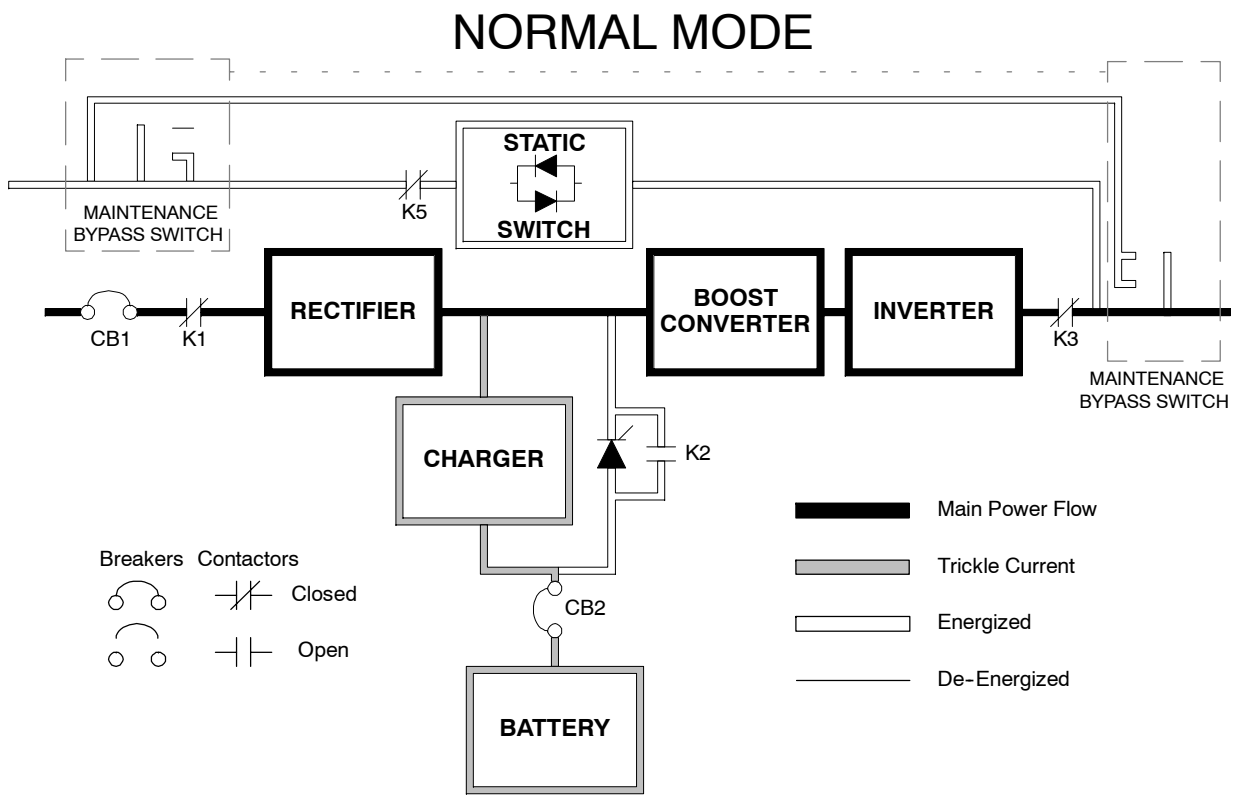

Figure 6−2. Path of Current Through the UPS in Normal Mode

During normal UPS operation, power for the system is derived from a utility input source through the input breaker CB1 and contactor K1. ”Normal” appears on the front panel and indicates the incoming power is within voltage and frequency acceptance windows. Three phase AC input power is converted to DC using a full−wave, six−pulse, solid−state rectifier block which supplies unregulated DC voltage to a boost converter which in turn supplies a higher and regulated DC voltage to the inverter. The battery is not charged directly from the unregulated rectifier. Instead, a separate battery charger is used to maintain the proper charge level on the battery during normal operation.

The battery charger derives its input from the unregulated DC output of the rectifier and provides regulated DC voltage and charge current to the battery. The battery charge condition is monitored by the UPS and reported by status indicators located on the LCD monitor panel. The battery is always connected to the UPS and ready to support the inverter should the utility input become unavailable.

The DC boost converter derives power from the unregulated DC rectifier and produces an elevated and stable DC voltage and current source for the inverter. The boost converter also establishes the systems output neutral for supporting single phase AC loads from any phase of the inverter output. The output neutral of the system is connected with the required neutral supplied at the utility bypass input and should never be bonded to ground at the modules output.

The inverter produces a three phase AC output to a customers load without the use of a transformer. The inverter derives power from the boost converters regulated DC and utilizes IGBT devices and pulse—width modulation (PWM) to produce a regulated and filtered AC output. The AC output of the inverter is delivered to the system output through the output contactor (K3).

If the utility AC power is interrupted or is out of specification, the UPS automatically switches to Battery mode to support the critical load with no interruption. When utility power returns, the UPS returns to Normal mode.

If the UPS becomes overloaded or unavailable, the UPS switches to Bypass mode. The UPS automatically returns to Normal mode when the overload condition is cleared and system operation is restored within specified limits.

If the UPS suffers an internal failure, it switches automatically to Bypass mode and remains in that mode until the failure is corrected and the UPS is back in service.

6.2.2 Bypass Mode

The UPS automatically switches to Bypass mode if it detects an overload, load fault, or internal failure. The bypass source supplies the commercial AC power to the load directly.

Figure 6−3 shows the path of electrical power through the UPS system when operating in Bypass mode.

CAUTION:
The critical load is not protected while the UPS is in Bypass mode.

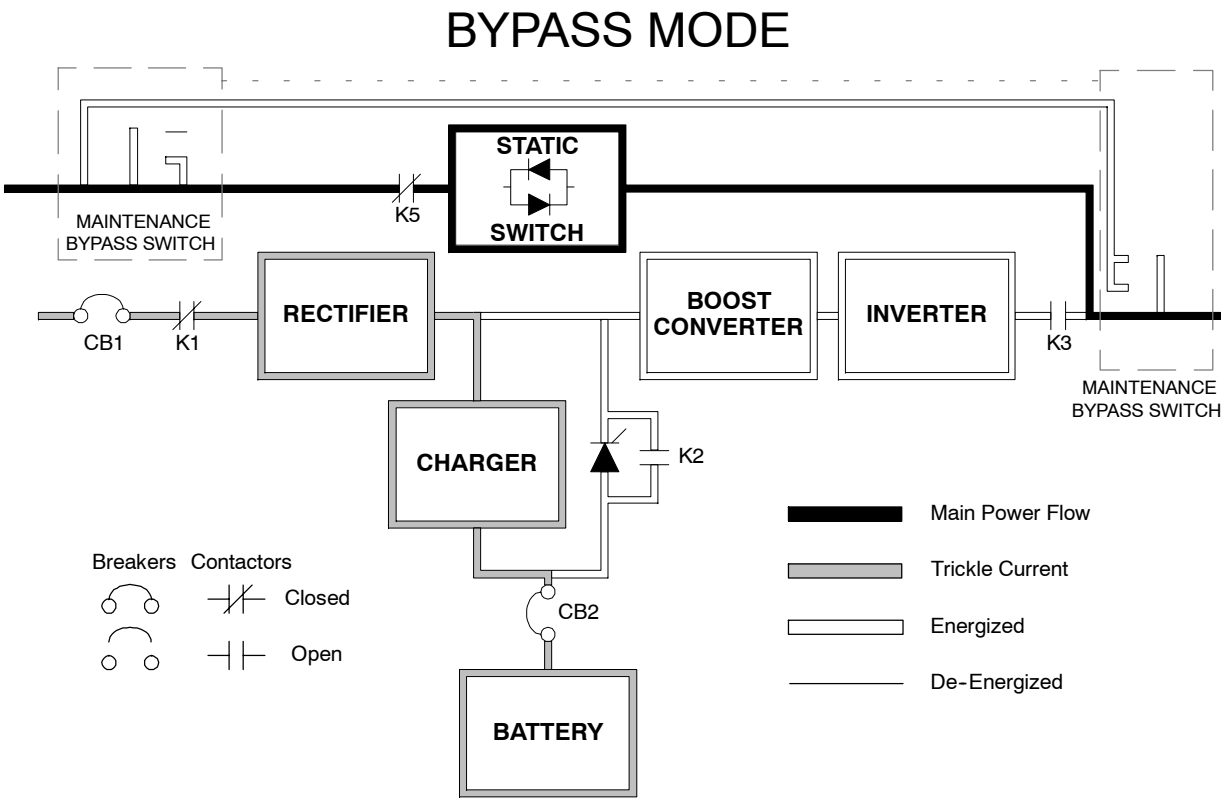

Figure 6−3. Path of Current Through the UPS in Bypass Mode

In Bypass mode, the output of the system is provided with three phase AC power directly from the system input. While in this mode, the output of the system is not protected from voltage or frequency fluctuations or power outages from the source. Some power line filtering and spike protection is provided to the load but no active power conditioning or battery support is available to the output of the system in the Bypass mode of operation.

The internal bypass is comprised of a solid state silicon controlled rectifier (SCR) static switch (SSW), and a back feed protection contactor (K5). The static switch is rated as a continuous duty device that is used anytime the boost converter and inverter is unable to support the applied load. The static switch is wired in series with the back feed protection contactor and together they are wired in parallel with

the inverter rectifier. The static switch being an electronically controlled device can be turned on immediately to pickup the load from the inverter while the inverter output contactor K3 opens to isolates the inverter. The back feed protection contactor is normally always closed ready to support the static switch unless the bypass input source becomes unavailable.

During an outage, transfers to bypass are prohibited and for the safety of those who may be working on the power lines upstream from the UPS, the back feed protection contactor is opened, preventing system output voltage from bleeding across the static switch snubber components to the bypass input source.

If the inverter is unable to support the load on the output of the system, to ensure the load remains energized, the UPS will transfer the load to the internal bypass. The output of the system will be transferred automatically to the internal bypass if any of the following abnormal conditions occur on the output of the system: If the output of the system exceeds acceptable voltage tolerances; System is overloaded; Inverter failure. The transfer is initiated by turning on the static switch and opening the output contactor K3. This kind of transfer is normally referred to as a Make−Before−Break transfer. The transfer should take place in less than 4 mS (quarter cycle) to ensure loads on the systems output are not interrupted. The static switch remains on until either the inverter is able to support the system output or the unit is placed into a maintenance position where repairs can be made.

If the UPS initiates its own transfer to bypass for any reason other than operator intervention, the UPS will attempt to restart the inverter (if not running already) and attempt a retransfer back on line to support the output of the system. Three attempts will be made within ten minutes to bring the inverter back on−line automatically before the UPS will lock out any further attempts. After three attempts have been made, the UPS will remain in bypass and an alarm condition will be enunciated. The UPS can also be transferred to bypass using the front panel controls.

Bypass mode is a normal operating mode, and not an alarm condition. However, if the UPS is unable to return to Normal mode following an automatic transfer to Bypass mode, an alarm condition is recorded.

6.2.3 High Efficiency Mode

When the UPS is operating in High Efficiency mode, the bypass source supplies the commercial AC power to the load directly.

Figure 6–4 shows the path of electrical power through the UPS system when operating in High Efficiency mode.

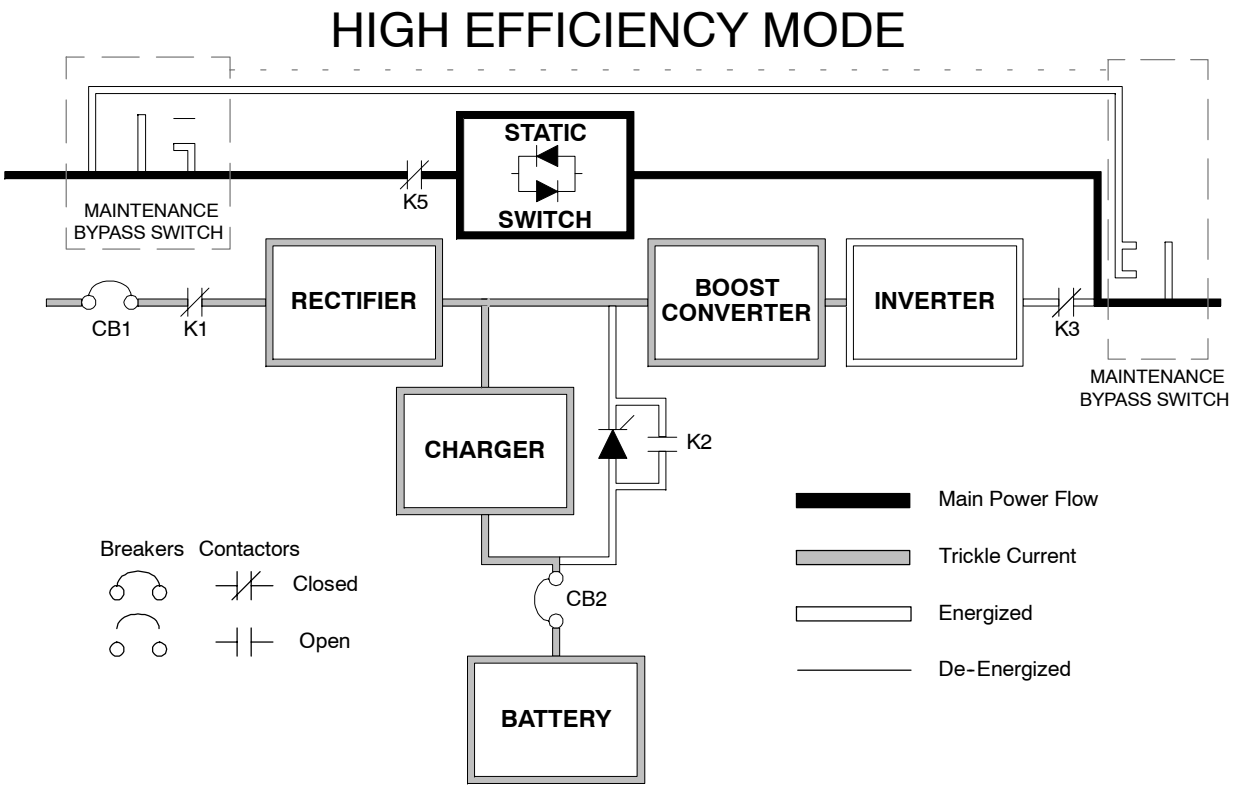

Figure 6–4. Path of Current Through the UPS in High Efficiency Mode

In High Efficiency mode, the output of the system is provided with three phase AC power directly from the system bypass input. Some power line filtering and spike protection is provided to the load but no active power conditioning or battery support is available to the output of the system in the High Efficiency mode of operation. However if the bypass source falls outside of a predetermined voltage or frequency window, the system forward transfers and the inverter assumes the load. The transfer takes place in less than 4 ms (quarter cycle), to ensure loads being fed by the system output are not interrupted.

The internal bypass is comprised of a solid state silicon controlled rectifier (SCR) static switch (SSW), and a back feed protection contactor (K5). The static switch is rated as a continuous duty device. The static switch is wired in series with the back feed protection contactor and together they are wired in parallel with the inverter.

In the High Efficiency mode, the static switch is turned on to supply the majority of the load current directly to the load while the Inverter remains on line, ready to assume suppling the load.

High Efficiency mode is a normal operating mode, and not an alarm condition. While the UPS is in High Efficiency mode, the **NORMAL** light on the front display will illuminate.

6.2.4 Battery Mode

The UPS transfers to Battery mode automatically if a utility power outage occurs, or if the utility power does not conform to specified parameters. In Battery mode, the battery provides emergency DC power that the inverter converts to AC power.

Figure 6−5 shows the path of electrical power through the UPS system when operating in Battery mode.

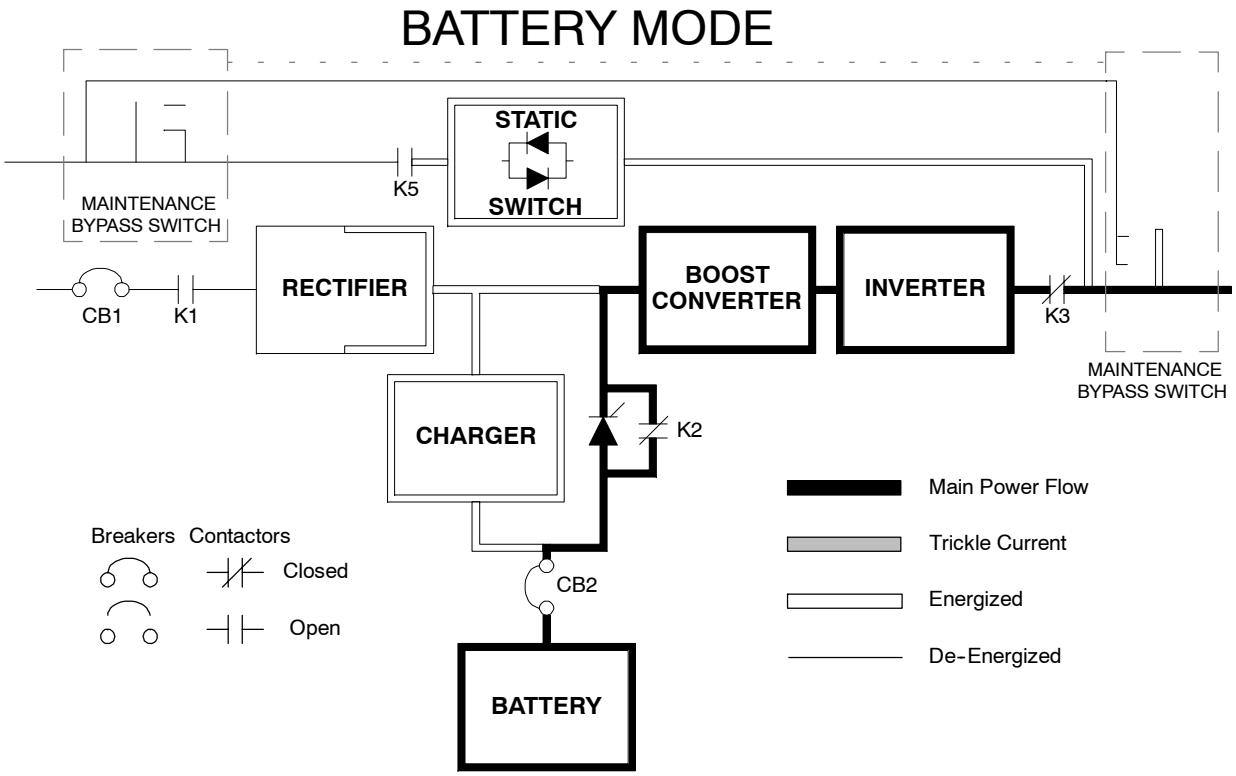

Figure 6−5. Path of Current Through the UPS in Battery Mode

During a utility power failure, the rectifier no longer has an AC utility source in which to supply the DC output current required to support the battery charger and boost converter. The input contactor (K1) is opened, the battery charger is turned off, and battery SCR (Q10) and battery contactor (K2) both receive signals to turn on enable to supply battery power to the system. Because the battery SCR is an electronic device, it supplies momentary battery power to the system during the time it takes the contacts of K2 to close. Energy stored in the battery is supplied instantaneously to the boost converter so that the inverter and customers load can be supported without interruption. If the bypass is common with the rectifier input, the Feed Back Protection contactor (K5) will also open. The opening of contactors K1 and K5 prevent static system voltages from bleeding backwards through the static switch and rectifier snubber components and re−entering the input source.

While in battery mode, the UPS will enunciate an audible horn, light a visual indicator lamp on the front panel (System Normal, On Battery), and make an entry into the alarm event history. As the battery discharges, the boost converter and inverter constantly makes minute adjustments enable to maintain a steady output. The UPS will remain in this operating mode until the input power to the rectifier is again within the specified voltage or frequency acceptance windows.

If the input power fails to return or is not within the acceptance windows required for normal operation, the battery will continue discharging until a DC voltage level is reached where the inverter output can no longer support the connected loads. When this occurs, the unit will issue another set of audible and visual alarms indicating SHUTDOWN IMMINENT. Unless the rectifier has a valid input soon, the output will only be supported for 2 minutes before the output of the system shuts down. If the bypass source is available, the system will transfer to Bypass instead of shuting down.

If at any time during the battery discharge the input power becomes available again, contactors K1 and K5 are closed and the rectifier will begin to supply DC current to the boost converter and inverter. The battery contactor K2 is opened while the battery charger is turned back on to begin recharging the battery. At this point, the unit returns to normal operation. Depending on the amount of load on the system and the duration of the battery discharge, battery current limit alarms may be seen for a short time due to the current required to recharge the battery.

The systems total operating time on battery will depend on many factors. Some factors that affect battery support times are battery type and capacity, number of parallel strings, environmental temperatures, age of the battery, and fluctuations in load demand during the discharge. The greater the load, the less support time the battery will have. Decrease the load, and the battery support time will generally increase.

6.2.5 Test and Maintenance Bypass Modes

An internal maintenance switch is used to safely supply utility power to the system output during periods of maintenance or repairs. Before this switch is used, the UPS should be transferred to bypass and the Power Processing Unit (PPU) should be turned off. This switch has three positions: UPS (normal), TEST, BYPASS. The bypass source supplies the commercial AC power to the load directly.

While on internal bypass, when a user rotates the maintenance switch from the UPS position to the TEST position, the load is wrapped around the UPS, while power is still supplied to the internal bypass. The static switch remains energized to support the load should the user rotate the switch back to the UPS (normal) position. When the maintenance switch is rotated back to the UPS position from the TEST position, the load is switched back to the internal bypass. If the maintenance switch is rotated to BYPASS instead of to UPS from the TEST position, the load remains wrapped around the UPS and power is removed from the entire upper half of the unit allowing service work to be completed on the unit safely.

Figure 6−6 shows the path of electrical power through the UPS system when operating in Test mode and Figure 6−7 shows the path of electrical power through the UPS system when operating in Maintenance Bypass mode.

CAUTION:
The critical load is not protected while the UPS is in Test or Maintenance Bypass modes.

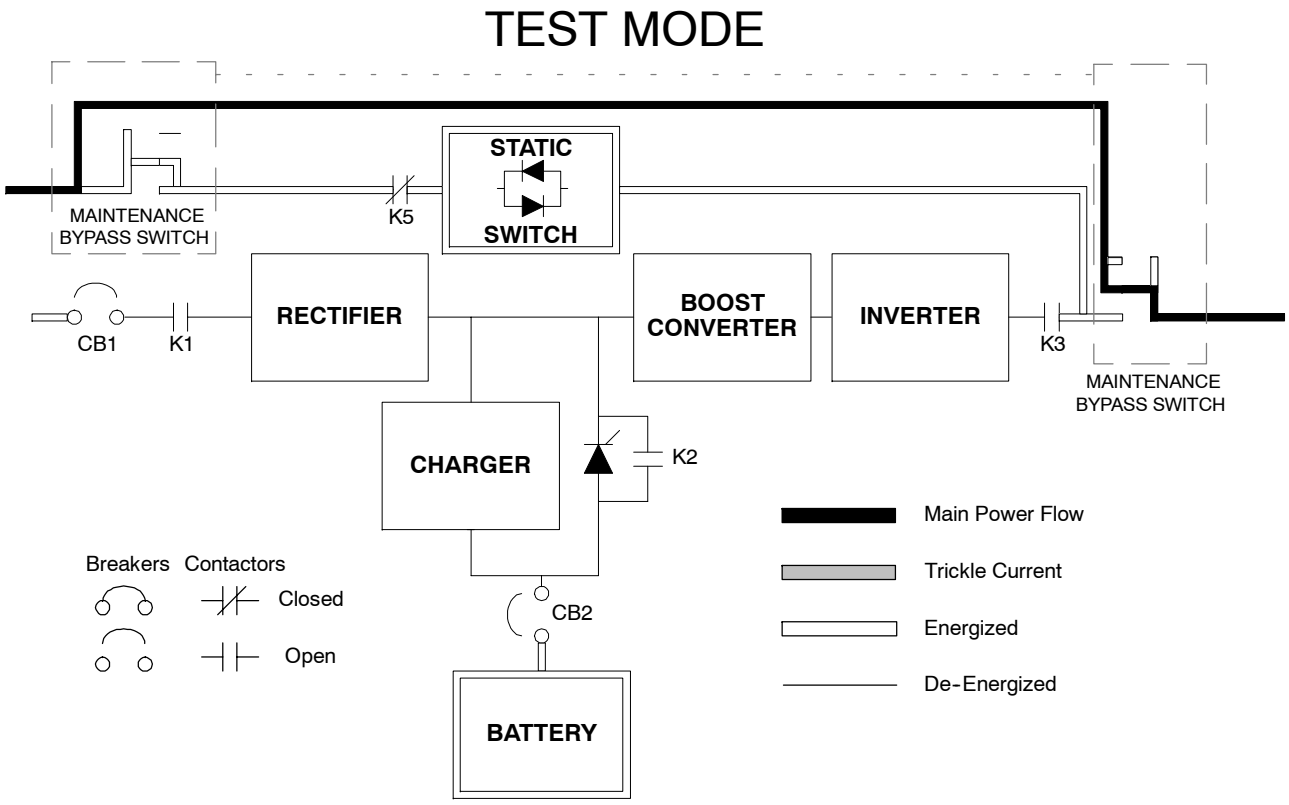

Figure 6−6. Path of Current Through the UPS in Test Mode

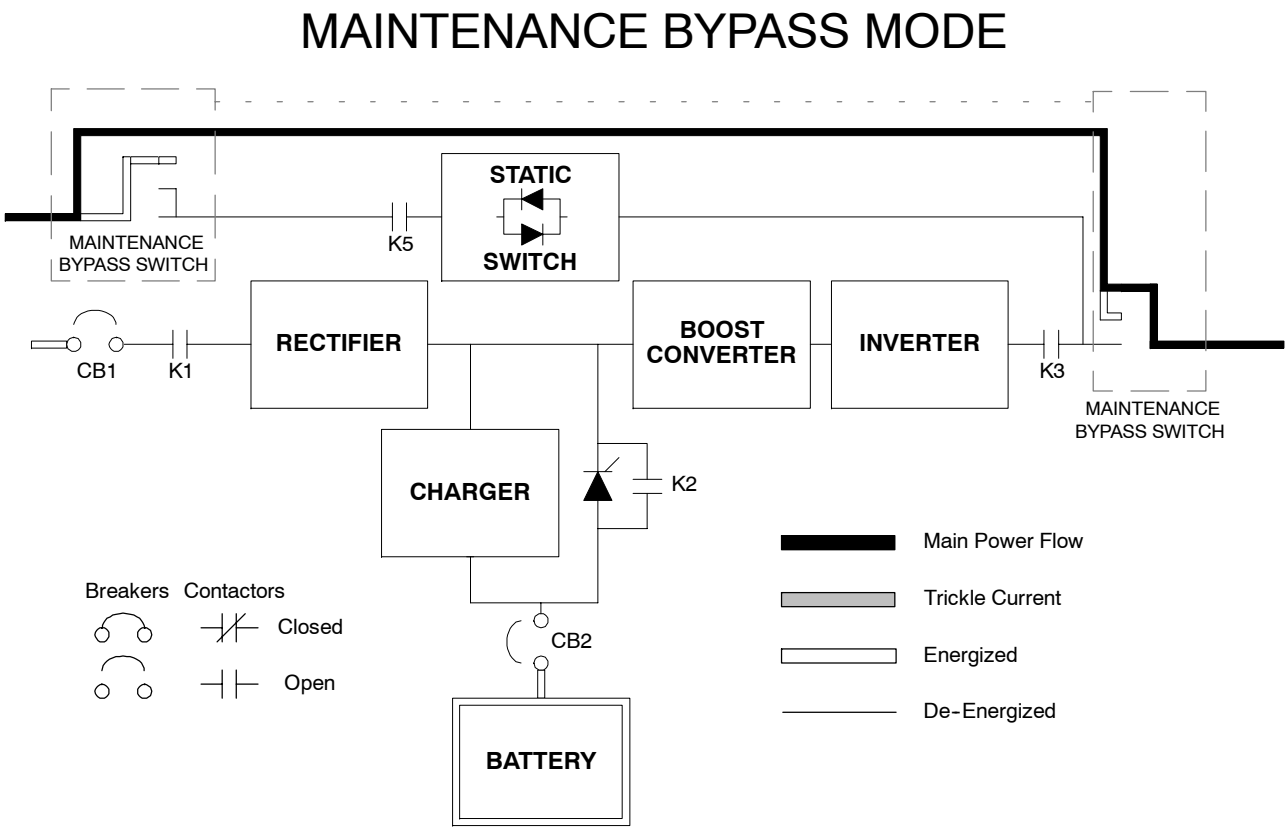

Figure 6−7. Path of Current Through the UPS in Maintenance Bypass Mode

6.3 Functional Description

The UPS is a true online unit with a series power train. An uncontrolled rectifier feeds a boost converter, which in turn powers the inverter. The bypass utilizes a static switch and a maintenance bypass switch is internal to the unit. The unit input is 3−wire in (plus ground) at the rectifier and 4−wire in (plus ground) at the bypass, and 4 wire output. The unit does not incorporate any galvanic isolation, input to output. The battery string comprises 144 cells (288 volts nominal) and is charged via a buck or boost converter powered from the raw DC IN from the input rectifier.

6.3.1 Input Rectifier

The Input Rectifier is a full wave bridge uncontrolled rectifier, which produces an unregulated DC IN Bus. The raw DC at this point will be approximately 290 VDC. A pre−charge system pre−charges the DC IN Bus prior to the input contactor being closed.

6.3.2 Boost Converter and Neutral Regulator

A Boost Converter converts the raw DC IN to a regulated DC Link of approximately 400 volts DC. It is operated in current mode and controlled using a variable frequency modulation technique at approximately 18−20 kHz. An artificial neutral is generated by the Neutral Regulator (Buck/Boost configuration in current mode control), which balances the center point to 1/2 the DC Link (+/− 200 Volts).

6.3.3 Inverter and Filter

The Inverter is a traditional (current mode controlled) hard−switched IGBT 3−phase topology. The IGBTs are modulated by a variable frequency, current−mode control technique at approximately 18−20 kHz. An output filter filters out the high frequency switching components (line to neutral).

6.3.4 Battery and Battery Charger

The Battery is comprised of a string of 144 cells, made up of twenty−four 12 volt Battery blocks. The Battery Charger is configured as a simple Buck or Boost current mode controlled converter (mode auto selected based on I out), powered by the raw DC IN, which regulates the battery charge voltage/current. The unit utilizes Advanced Battery Management (ABM) technology, which essentially isolates the Battery from the electrical environment, except for periodic charging or reserve mode operation, extending its life.

6.3.5 Bypass

The Bypass has a continuously rated SCR switch in the Bypass circuit and a contactor in the Inverter leg. In normal mode, the Contactor connects the Inverter to the output. A backfeed contactor is also provided.

6.3.6 Maintenance Bypass

A user accessible shrouded 4−wire Mechanical Maintenance Bypass switch is provided.

6.3.7 External Batteries

External Batteries connect in parallel to the Internal Battery via an internal breaker. The internal charger charges the Batteries in parallel or in conjunction with an optional external charger

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Operational Controls and Features

7

7.1 General

The UPS system should function automatically and require very little attention during normal operation. The controls and indicators identified in this section are used during startup, to monitor normal operation and during abnormal events.

Figure 7−1 identifies and shows the location of the controls and indicators on the Powerware 9330 (10 kVA−20 kVA) UPS and Figure 7−2 identifies and shows the location of the controls and indicators on the Powerware 9330 (25 kVA−40 kVA) UPS. The descriptions provide a brief overview of the UPS controls, and standard and optional features.

NOTE: *Read the Operation section of this manual and have thorough knowledge of UPS operation before attempting to operate any of the UPS controls or optional components.*

7.2 UPS Operational Controls

The UPS has many standard features that provide cost-effective and consistently reliable power protection:

7.2.1 Control Panel

The *Control Panel* on the front of the UPS contains an LCD screen to display the current status of the UPS system. You can view a statistical history and log of system events and display a real-time graphic representation of power flowing through the system components. Backlit status indicators show the operating mode of the UPS and alert you to system events. Soft keys provide navigation through the information and control screens. The **LOAD OFF** pushbutton is located at the top right of the control panel. Below the **LOAD OFF** pushbutton is the System Control pushbutton, which provides access to the power control functions of the UPS. The Control Panel is described in detail in chapter 8, “Using the Control Panel”.

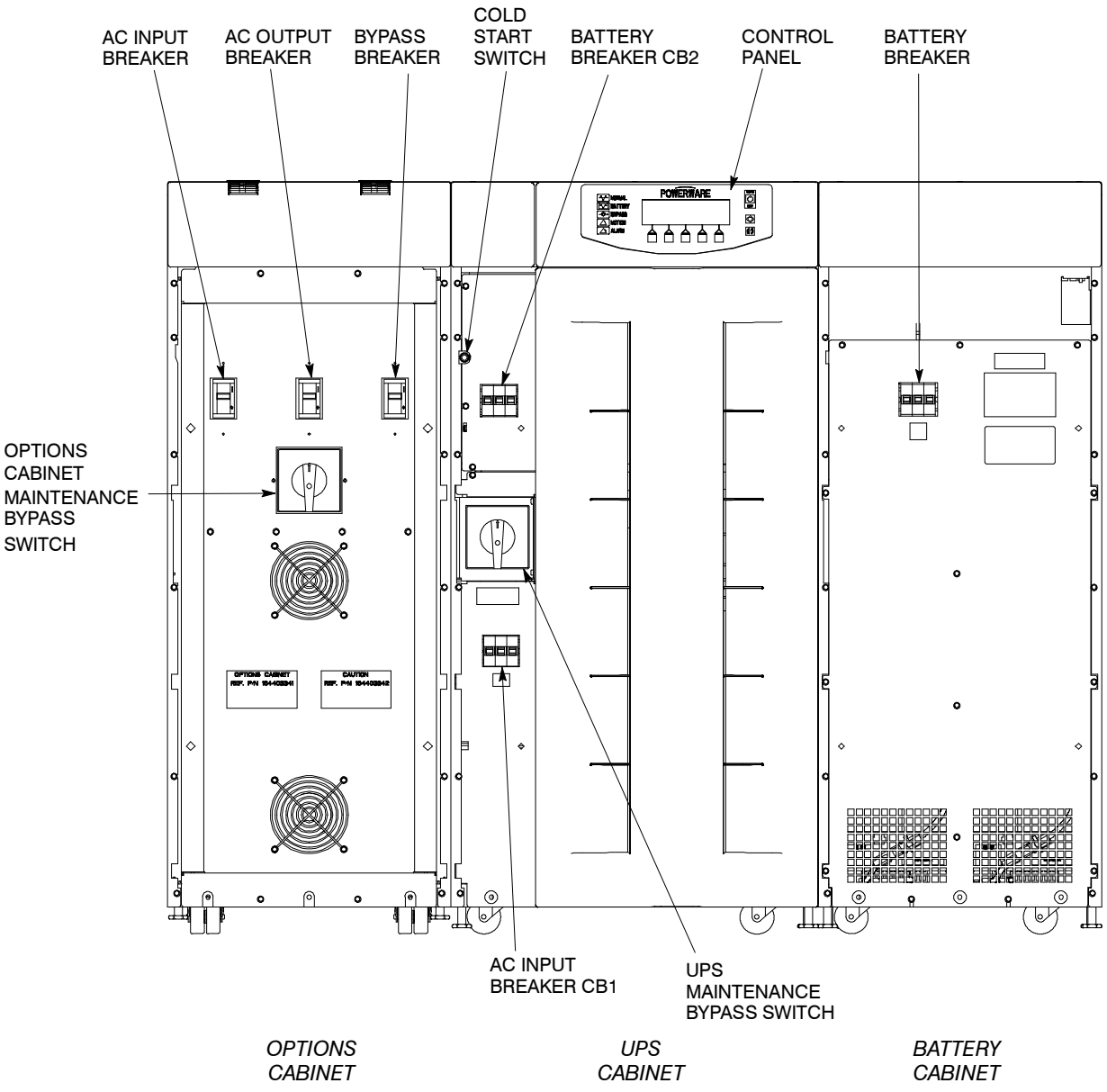

Figure 7−1. Powerware 9330 (10 kVA−20 kVA) UPS Controls and Indicators

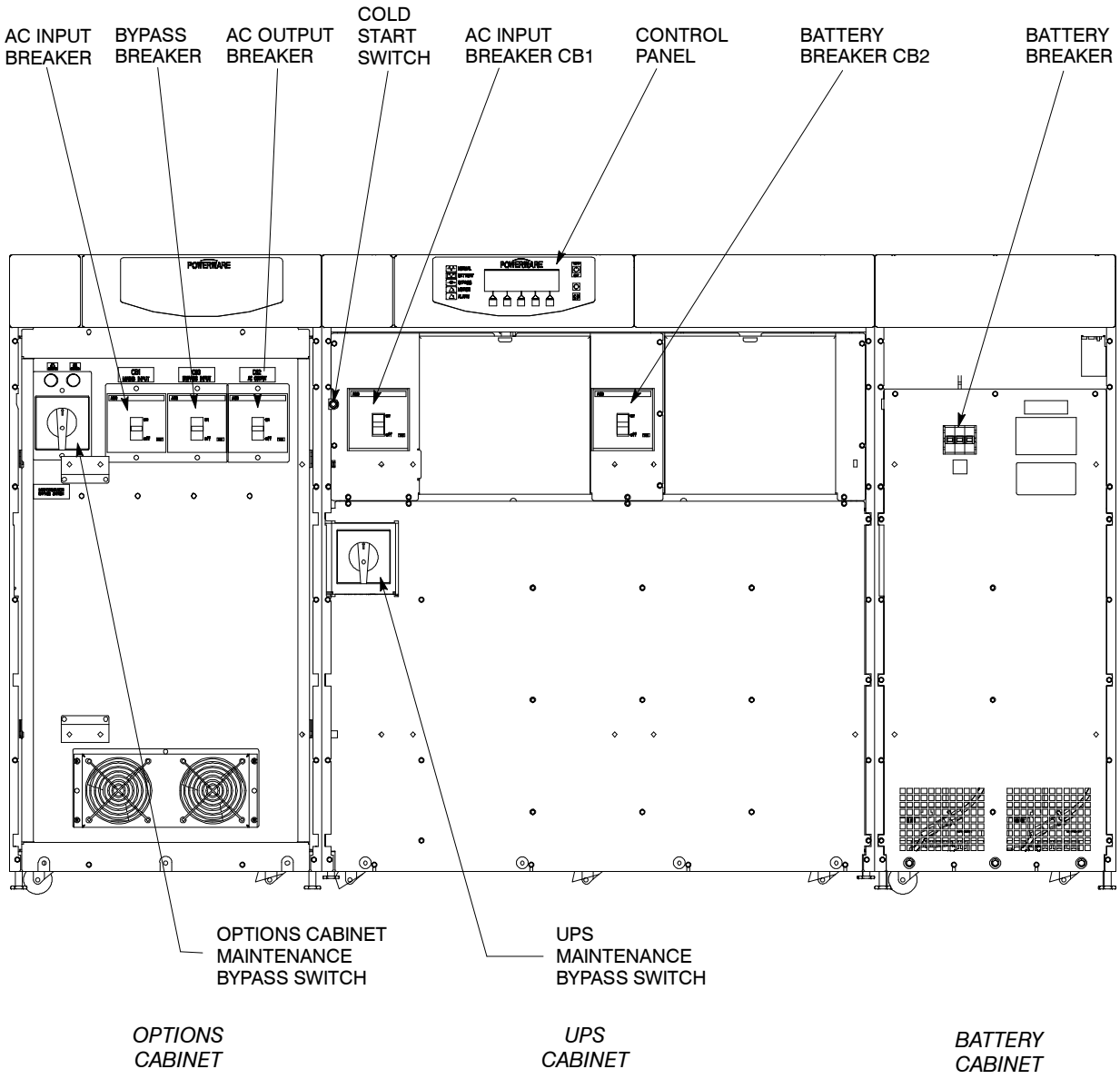

Figure 7–2. Powerware 9330 (25 kVA–40 kVA) UPS Controls and Indicators

7.2.2 UPS Circuit Breakers

The UPS can contain as many as 10 circuit breakers, depending on the system options. The UPS circuit breakers are described in detail in Chapter 9, “UPS Operating Instructions.”

UPS Cabinet
CB1 controls the input to the UPS rectifier, while CB2 controls the battery input to the UPS inverter. CB1 and CB2 are manually controlled.

Optional Battery Cabinet
A local battery circuit breaker controls the output of each battery cabinet, providing the ability to service each battery string individually.

Optional Options Cabinet
Input, output, and bypass circuit breakers control the flow of current to and from the installed transformers.

7.2.3 Smart LOAD OFF

A smart **LOAD OFF** pushbutton is provided for situations where you must quickly control the UPS output. The pushbutton is located on the front of the UPS for quick access, but provides a safety feature to prevent inadvertent load dumps. The **LOAD OFF** pushbutton is described in detail in Chapter 9, “UPS Operating Instructions.”

7.2.4 Maintenance Bypass Switch

An internal Maintenance Bypass switch is provided to completely isolate the main power processing unit of the UPS during service. The **Maintenance Bypass Switch** is described in detail in Chapter 9, “UPS Operating Instructions.”

7.2.5 Cold Start Switch

A Cold Start switch is provided to start the UPS in Battery Mode when no commercial power is available. The **Cold Start Switch** is described in detail in Chapter 9, “UPS Operating Instructions.”

7.3 UPS Standard Features

The UPS has many standard features that provide cost-effective and consistently reliable power protection:

7.3.1 Customer Interface

Computer Interface
One serial communications port is standard on all units, and is electrically isolated from the UPS. You can use this ports to link the UPS to the features described in Chapter 12, *“*Serial Communications*”* and Chapter 13, “Remote Notification.”

Building Alarm Monitoring
You can connect your facility’s alarm system contacts to four (4) inputs in the UPS. The UPS uses these inputs to monitor your building alarms in addition to the UPS status. This feature is described further in Chapter 10, “Using Features and Options.”

Summary Alarm Contacts

Alarm contacts are provided for connection to equipment at your facility, such as a light, an audible alarm, or a computer terminal. The equipment you connect to these contacts alerts you to an UPS alarm. This feature is described further in Chapter 10, "Using Features and Options."

7.3.2 Advanced Battery Management

A three stage charging system increases battery service life by optimizing recharge time, and protects batteries from damage due to high current charging and inverter ripple currents. Charging at high currents can overheat and damage batteries.

7.3.3 High Efficiency Mode

A High Efficiency Mode is available that allows the UPS to operate in an offline bypass mode. In this mode, the UPS is operating on bypass, with the power processing unit in standby, ready to automatically transfer to normal mode if a commercial electrical power brownout, blackout, overvoltage, undervoltage, or out-of-tolerance frequency condition occurs.

7.3.4 Customer Convenience Outlet

An uninterruptible 120VAC, 0.2 amp, fuse-protected convenience outlet is provided to supply power to the optional modem. It is located on the Customer Interface Panel.

7.3.5 Installation Features

Power wiring can be routed through the rear and bottom of each cabinet with connections made to easily accessible terminal blocks. External sensing and monitoring control wire must be installed in accordance with Class 1 wiring methods. Class 1 wiring can be routed through the top of each cabinet.

Communications option cards are quickly installed through the rear panel. X−Slot cards are hot pluggable.

7.4 Options and Accessories

Contact your sales representative for information about any of these available options:

7.4.1 Remote EMERGENCY POWER OFF

A **REMOTE EMERGENCY POWER OFF** pushbutton is a required option to provide for situations where you must instantaneously control the UPS output. The operation of the **REMOTE EMERGENCY POWER OFF** pushbutton is described in detail in Chapter 9, "UPS Operating Instructions."

7.4.2 Remote Monitor Panel

An optional *Remote Monitor Panel (RMP)* contains backlit status indicators and a local horn, allowing you to monitor the operational status and alarm condition of the UPS from virtually any location within your facility. You can install multiple RMPs at remote locations to increase your monitoring capabilities. This option is described further in Chapter 10, “Using Features.”

7.4.3 Options Cabinet

Input Isolation Transformer
An optional 208/208, 480/208, or 600/208 VAC *input isolation transformer* provides an isolated input to the UPS rectifier for applications that require a DC link that is not ground referenced or for applications requiring an input of 480 or 600 VAC. The transformer is contained in the separate options cabinet.

Bypass Input Isolation Transformer (Dual Input)
An optional 208/208, 480/208, or 600/208 VAC *bypass input isolation transformer* provides an isolated input to the UPS bypass for applications that require an isolated bypass and an independently derived neutral, or for applications requiring an input of 480 or 600 VAC. The transformer is contained in the separate options cabinet.

Output Isolation Transformer
An optional 208/208 or 208/480 VAC *output isolation transformer* provides an isolated output to the critical load or for applications that require 480 VAC. The transformer is contained in a separate options cabinet.

Maintenance Bypass Switch
An internal Maintenance Bypass switch is provided to completely isolate the UPS during service. The **Maintenance Bypass Switch** is described in detail in Chapter 9, “UPS Operating Instructions.”

Power Distribution Module
An optional output *Power Distribution Module* (PDM) is available to distribute the output power from the UPS to your critical load. The PDM contains up to 42 circuit breaker switches (Square-D Type QO or QOB) that can be assigned with flexibility to meet facility needs. The PDM is enclosed below the hinged top of the Options Cabinet.

7.4.4 Battery Cabinets

System protection can be enhanced by equipping the UPS system with one to five battery cabinets containing sealed lead-acid, maintenance-free batteries, in addition to the internal batteries. The battery cabinets are designed for line up and match installation and utilize quick disconnect cables for easy installation. The cabinets use 24 Yuasa Type NPX−100R or NPX−100B batteries.

7.4.5 Parallel Cabinet

The Parallel Cabinet allows the creation of a system that allows two to four UPMs to operate in parallel capacity or redundancy to provide more capacity than a single UPM and as backup for each other.

7.4.6 Communications

Modem

An optional modem is available for use with the Remote Notification feature described in Chapter 13, “Remote Notification”. Refer to the manual supplied with the modem for modem operating instructions.

X--Slot

Up to four optional cards can be installed in the UPS module at any time, providing the following connectivity:

- Single RS−232 port
- Multiple RS−232 ports
- AS−400 interface
- SNMP adapter
- Modem driver
- Web enabled SNMP adapter
- Mod Bus driver.

7.5 Safety Considerations

The UPS enclosure is designed for industrial or computer room applications, and contain safety shields. However, the system is sophisticated and should be handled with appropriate care, following these guidelines:

- **Keep surroundings clean and free from excess moisture.**
- **Do not operate the system close to gas or electric heat sources.**
- **The system is not intended for outdoor use.**
- **The system operating environment should be maintained within the parameters stated in this manual.**
- **Keep the system doors closed to ensure proper cooling airflow and to protect personnel from dangerous voltages inside the unit.**
- **The system contains its own power source. Lethal voltages are present even when the system is disconnected from utility power.**

WARNING:
Only AUTHORIZED SERVICE PERSONNEL should perform service or maintenance on the UPS.

If service or routine maintenance is required:

- **Ensure all power is disconnected before performing installation or service.**
- **Ensure the area around the UPS is clean and uncluttered.**
- **Battery cabinet maintenance or battery replacement should be performed only by authorized service personnel.**
- **Observe all DANGER, CAUTION, and WARNING notices affixed to the inside and outside of the equipment.**
- **Always conform to the more detailed safety precautions described in "Important Safety Instructions" section of Chapter 14.**

7.6 Symbols, Controls, and Indicators

These symbols may appear on your UPS system or on labels inside the UPS. They are accepted by most international safety agents. Everyone in your organization who works with your system should understand the meaning of these symbols:

ON
The principal power switch is in the “On” position.

OFF
The principal power switch is in the “Off” position.

PHASE
The word “phase.”

CAUTION: REFER TO MANUAL
Stop and refer to the Operator’s Manual for more information.

RISK OF ELECTRIC SHOCK
There is a risk of electric shock present, and you should observe associated warnings. The UPS contains high voltages.

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Using the Control Panel

8.1 Description

This chapter describes the UPS Control Panel, including controls and indicators, and how to monitor UPS operation. The Control Panel is located on the front of the UPS (see Figure 8–1).

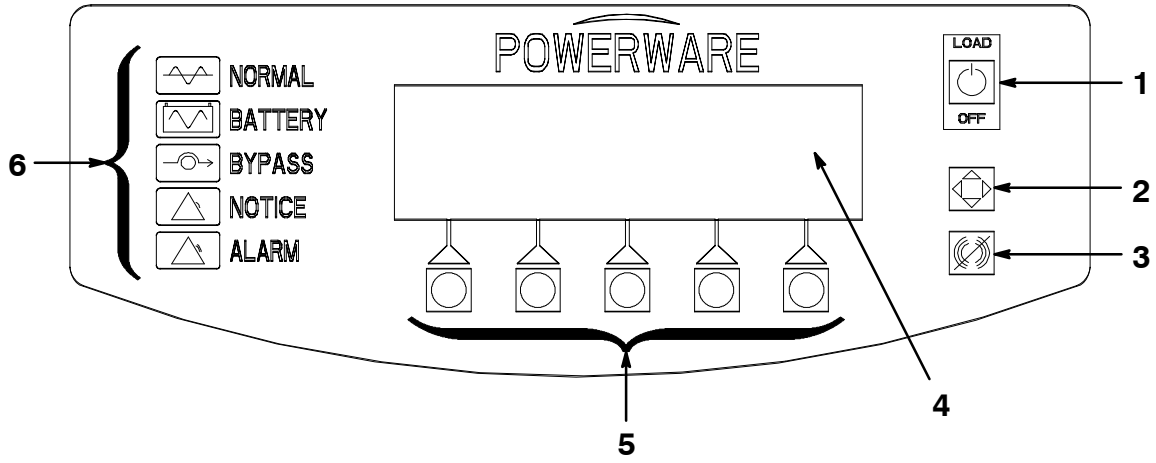


Figure 8–1. UPS Control Panel

The Control Panel contains the red **LOAD OFF** pushbutton switch (**1**), a dedicated system control pushbutton switch (**2**), an audible Alarm Off (horn off) pushbutton switch (**3**), a flat Liquid Crystal Display (LCD) screen (**4**), a horizontal row of pushbutton switches (**5**), and a vertical column of backlit status indicators, (**6**). The following sections describe using the UPS Control Panel to monitor the UPS. Refer to Chapter 9 *UPS Operating Instructions* for use of the operational controls.

8.2 Using the LCD Screen and Pushbuttons

The LCD screen on the Control Panel provides an operator interface with the UPS system. Figure 8–2 identifies the display areas discussed in the following sections.

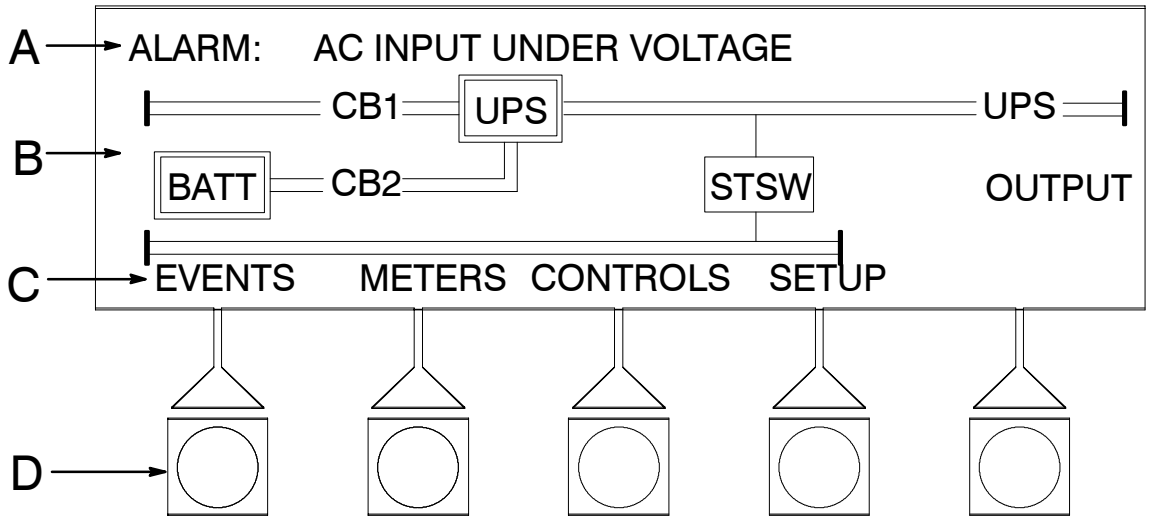


Figure 8–2. Parts of the LCD Screen

A The *UPS status area* automatically scrolls between the current date and time, active alarms, active notices, and load percent and battery run time for the UPS. Shown is a typical alarm message. (For more information about alarms and notices, refer to Chapter 11, "Responding to System Events.")

B The *information area* contains data about UPS status and operations. Select a menu option to display the desired information.

C The display menu lists the titles of the available screens. To select a screen, depress the pushbutton underneath the desired screen.

D Softkey pushbutton switches. Function changes depending on the screen displayed. Use to select menu screens or scroll through available screens. Designated function is indicated on the LCD screen above the respective pushbutton.

To select the System Control screen or turn off the Alarm, depress the respective pushbutton to the right of the LCD screen.

You can use the LCD screen and the pushbuttons beneath or to the right of it to:

- Control UPS operation (see paragraph 8.4)
- Set UPS parameters (see paragraph 8.3.4)
- Monitor UPS operation (see paragraph 8.3.3)
- Look at a log of UPS events (alarms, notices, and commands) (see paragraph 8.3.2).

After approximately one hour, the display screen dims. To restore the screen, press any pushbutton once.

8.3 Using the Main Menu

The UPS *main menu* allows you to display data in the information area to help you monitor and control UPS operation. The following menus and options are available:

- **EVENTS** Displays the list of Active System Events and a historical log of system events.
- **METERS** Displays performance meters for the system or critical load.
- **CONTROLS** Displays the System Controls screen.
- **SETUP** Allows you to set the display contrast, set the date and time for the time stamp, configure the UPS serial communication ports and view the firmware version numbers.
- ↵ Returns to Main Menu and displays a real-time graphic representation of the flow of current through the internal UPS components.

8.3.1 Mimic Screen

Figure 8–3 shows the LCD screen as it appears when you first start the UPS. To select the mimic screen from the Events, Meters, Setup or System Controls screens, select the ↵ pushbutton from the current display menu.

The Mimic screen shows the internal components of the UPS cabinet and a real-time graphical representation of the flow of current through the system.

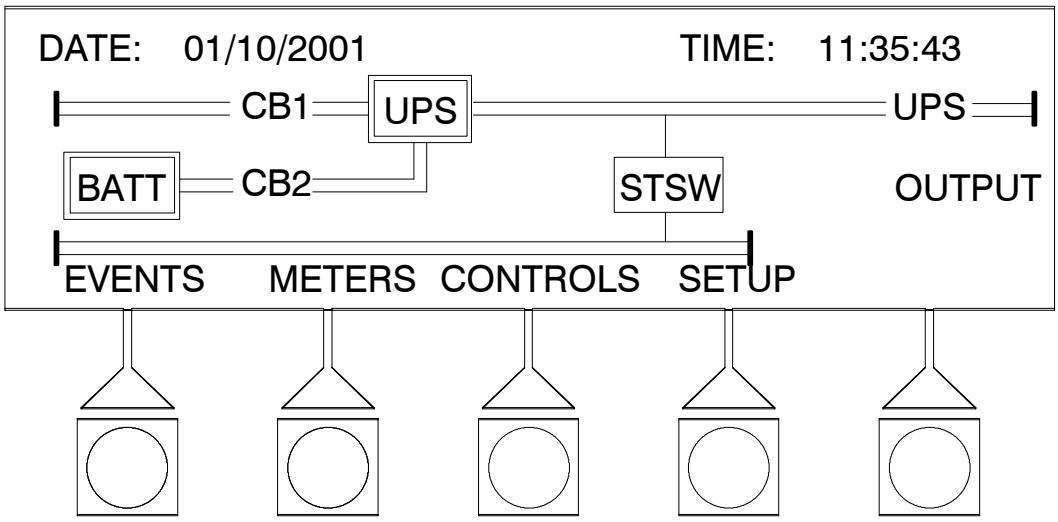


Figure 8–3. Mimic Screen

8.3.2 System Event Screens

Select **EVENTS** from the Main menu to display the Event History Log. The Event History Log lists up to 500 system events in chronological order, with the most recent event listed last. The end of the log (the most recent events) appears when you display the screen, and you must scroll upward to view older event listings. Figure 8–4 shows the Event History Log screen.

To scroll through the events, select the ⬆ or ⬇ pushbuttons from the display menu.

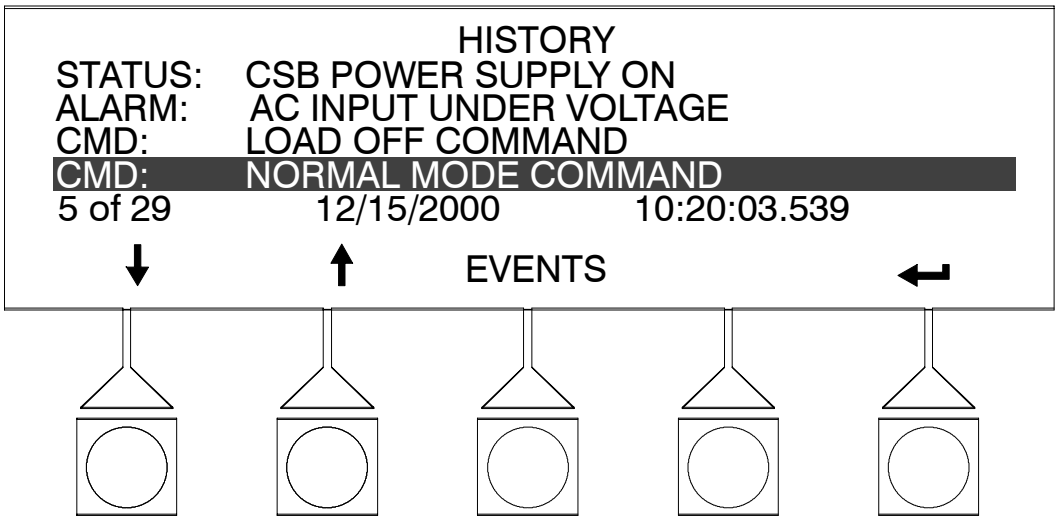


Figure 8–4. Event History Log Screen

Select **EVENTS** from the History screen menu to display a listing of all system events that are currently active. The most recent system event is listed first. As events clear, they are removed from the Active System Events listing. Figure 8–5 shows the Active System Events screen.

To scroll through the events, select the ⬆ or ⬇ pushbuttons from the display menu. To return to the History screen, select **HISTORY** from the Active Events menu.

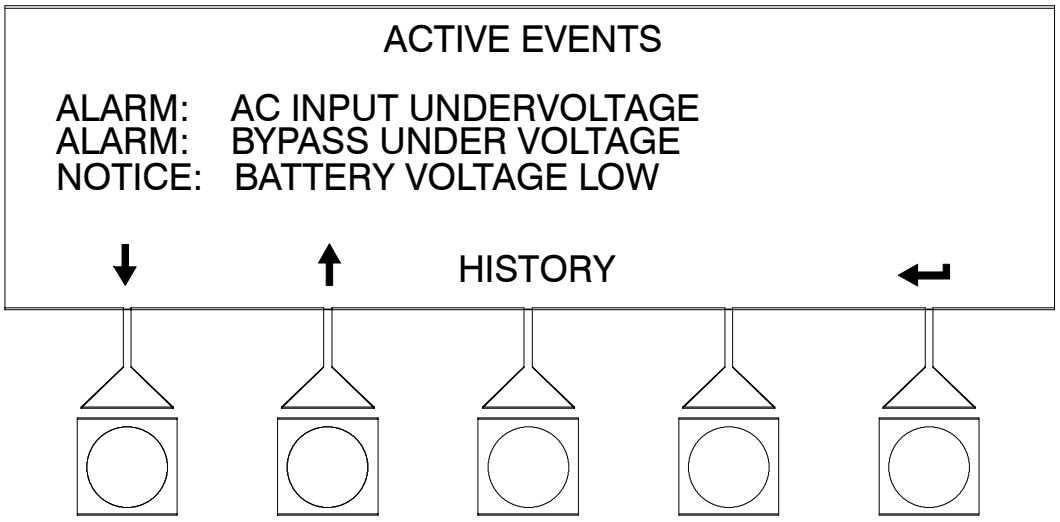


Figure 8–5. Active System Events Screen

8.3.3 System Meter Screens

Select **METERS** from the Main menu to display the System Meter screens. Figures 8–6 through 8–10 show the System Meter screens.

To scroll through the meter screens, select the ← or → pushbuttons from the display menu. The current UPS readings are displayed in the information area of the screen.

The Input screen shows the phase-to-phase voltage, phase current, and frequency, of the incoming utility, followed by the KVA, KW, and power factor measurements.

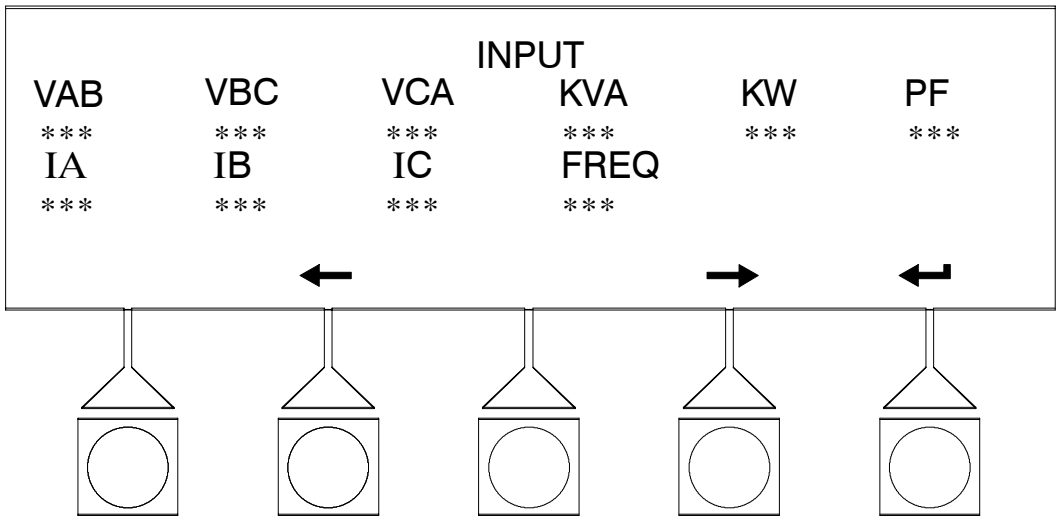


Figure 8–6. Input Meter Screen

The Output screen shows the phase-to-neutral voltage, phase current, and frequency, being supplied by the UPS, followed by the KVA, KW, and power factor measurements.

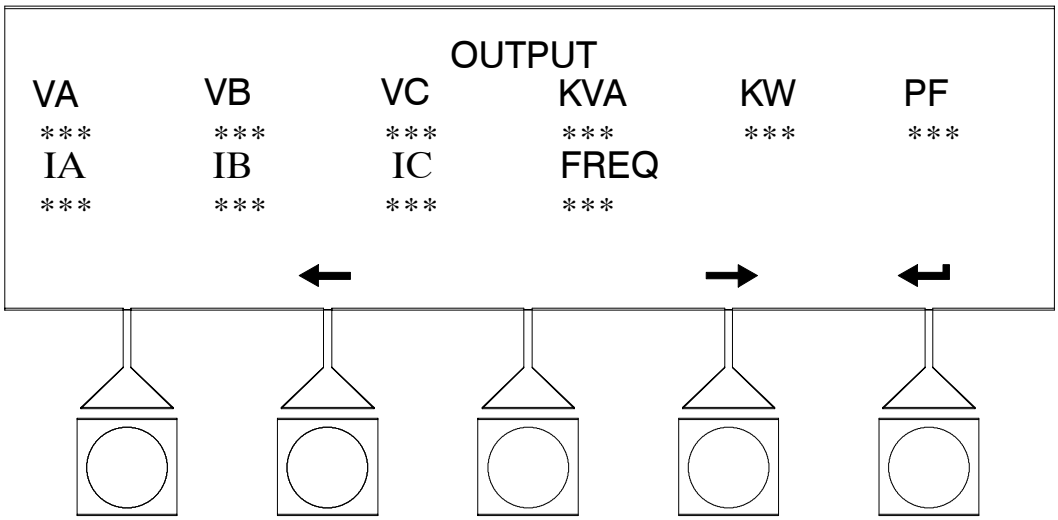


Figure 8–7. Output Meter Screen

The Bypass screen shows the phase-to-neutral voltage, and frequency of the bypass source.

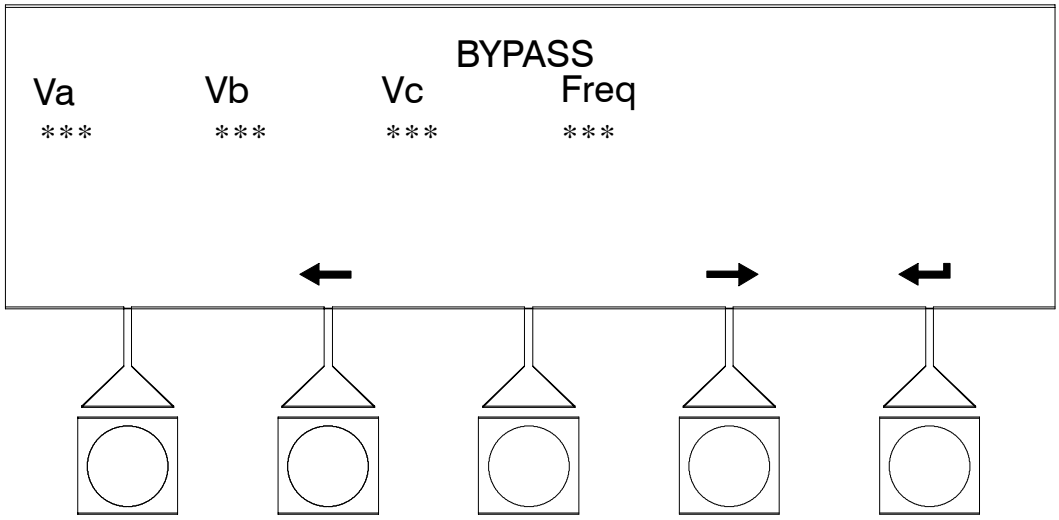


Figure 8–8. Bypass Meter Screen

The Battery screen displays the DC voltage (V), the DC current (I), and the minutes of battery time remaining.

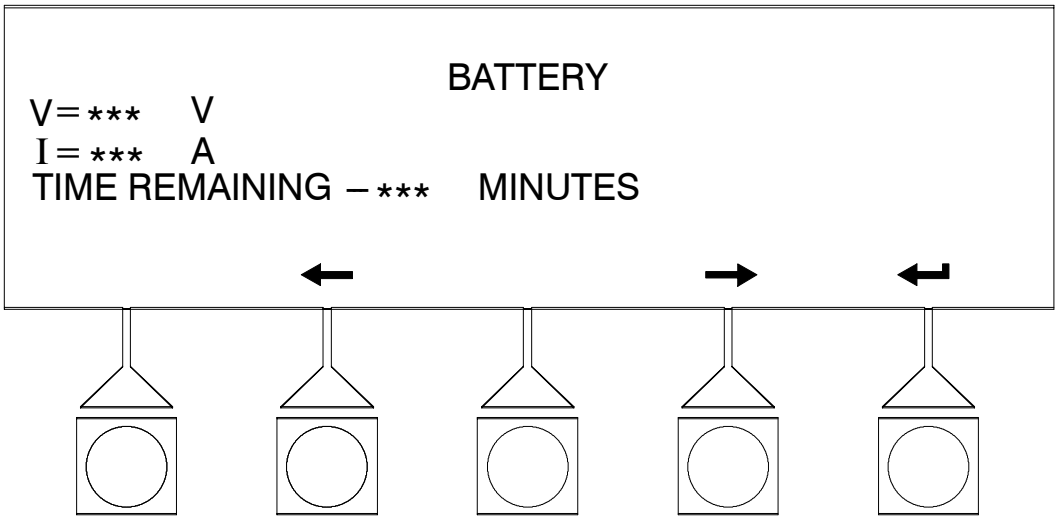


Figure 8–9. Battery Meter Screen

The Output Current Screen displays a real-time bar graph of the output current of the UPS. The graph shows the current for each phase.

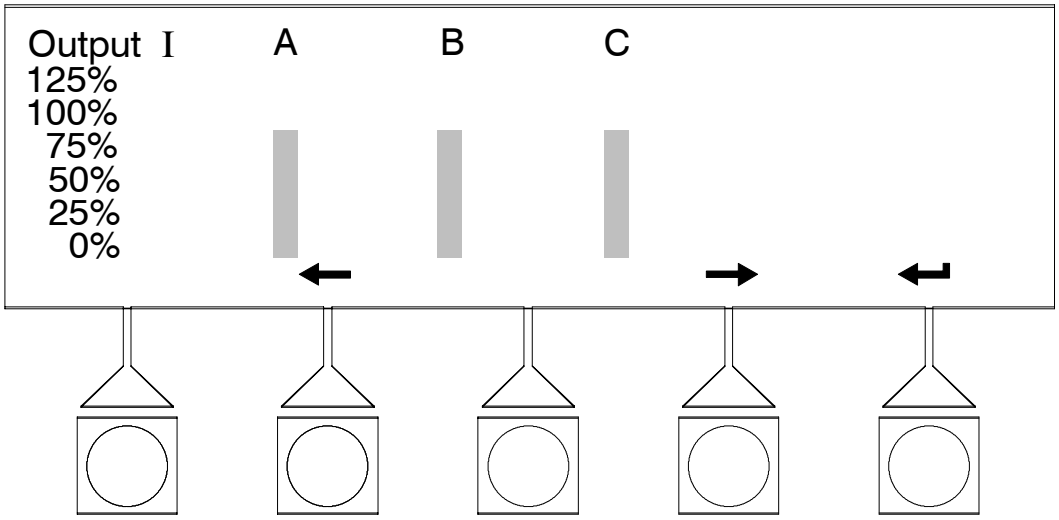


Figure 8–10. Output Current (Load) Meter Screen

8.3.4 Setup Menu Screens

Select **SETUP** from the Main menu to display the System Setup Screen. This screen can be used to set the screen contrast, the UPS date and time, the serial ports, and show the firmware versions installed. Figure 8−11 shows the System Setup menu screen.

Use the ↑ or ↓ pushbuttons to highlight the setup function desired, then choose the function using the **SELECT** pushbutton.

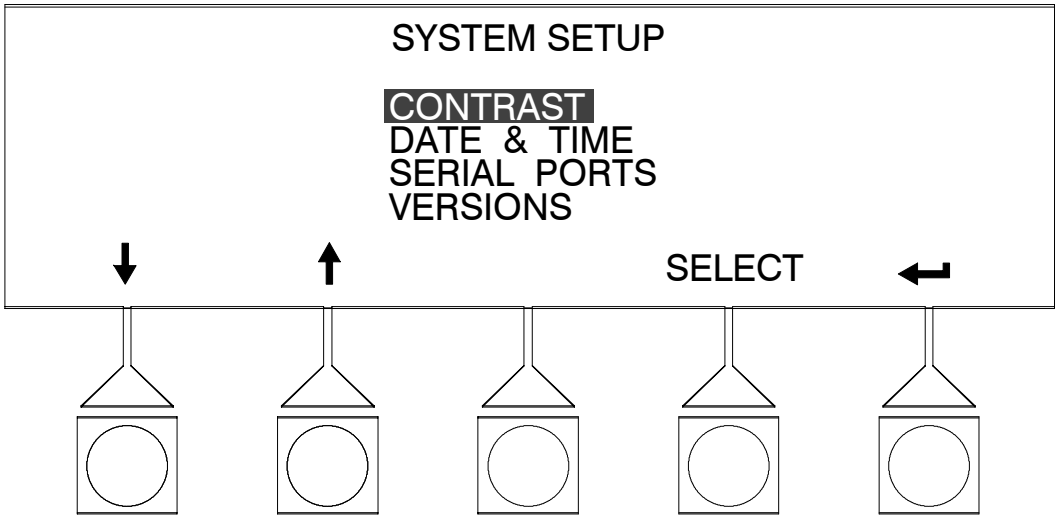


Figure 8−11. Setup Menu Screen

Select **CONTRAST** from the System Setup menu to display the Contrast Adjust screen. Figure 8−12 shows the Contrast Adjust screen.

Use the ← or → pushbuttons to adjust the contrast for the LCD screen. To return to the System Setup menu screen, select the ↵ pushbutton.

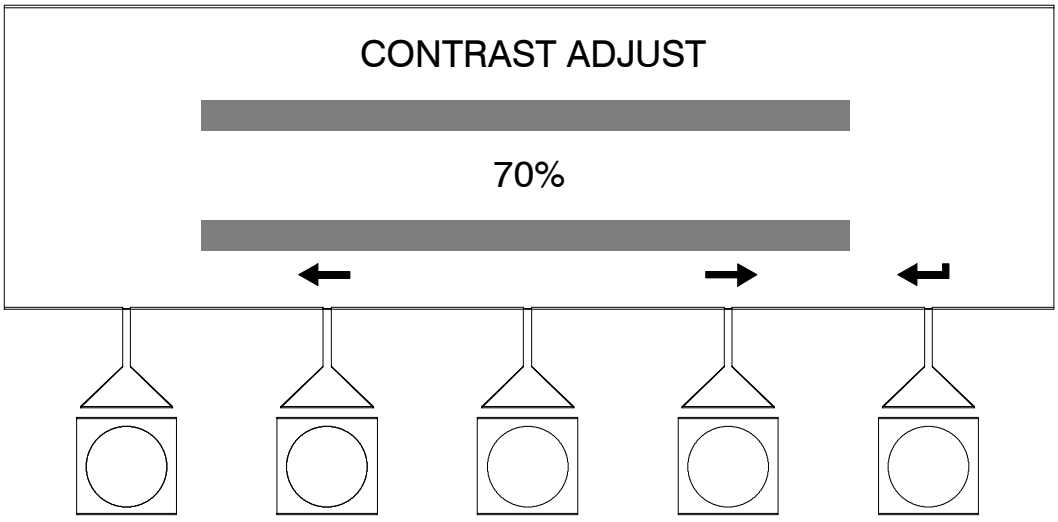


Figure 8−12. Contrast Adjust Menu Screen

Select **DATE &TIME** from the System Setup menu to display the Date & Time screen. The Date & Time screen allows the internal date & time stamp of the UPS to be set. The stamp is used for logging events in the Event History Log. Figure 8–13 shows the Date & Time screen.

Use the ← or → pushbuttons to highlight the setting to be changed. Use the ↑ or ↓ pushbuttons to make the change. When finished making changes, use the ← or → pushbuttons to highlight SAVE and the ↑ or ↓ pushbuttons to select YES To complete the save function and return to the Setup Menu screen, select the ↵ pushbutton.

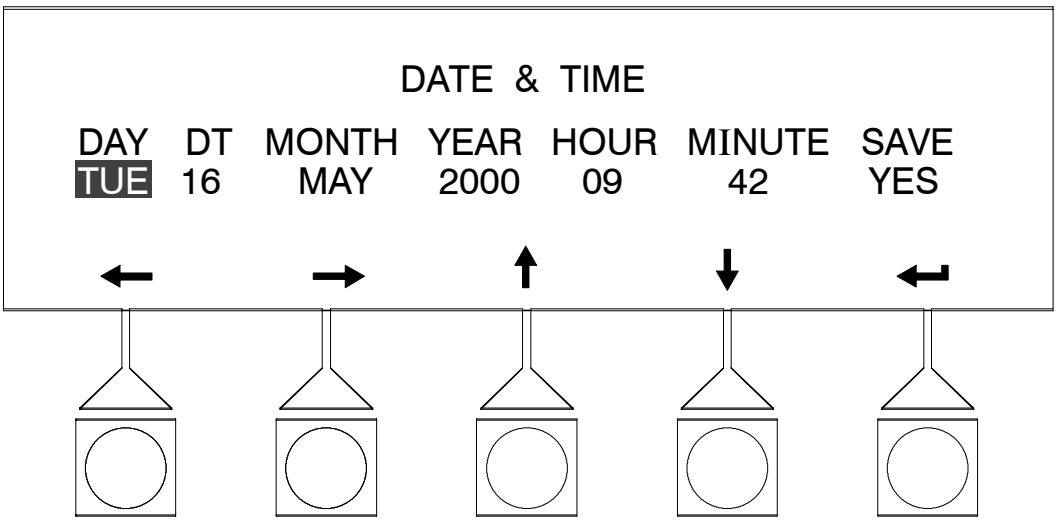


Figure 8–13. Date & Time Screen

Select **SERIAL PORTS** from the System Setup menu to display the Serial Port screen. The Serial Port screen allow you to specify settings for the serial communication ports on the UPS. Figure 8–14 shows the Serial Ports screen. For detailed information about configuring the serial ports, refer to Chapter 12, *"Serial Communications."*

Use the ← or → pushbuttons to highlight the setting to be changed. Use the ↑ or ↓ pushbuttons to make the change. When finished making changes, use the ← or → pushbuttons to highlight SAVE and the ↑ or ↓ pushbuttons to select YES To complete the save function and return to the Setup Menu screen, select the ↵ pushbutton.

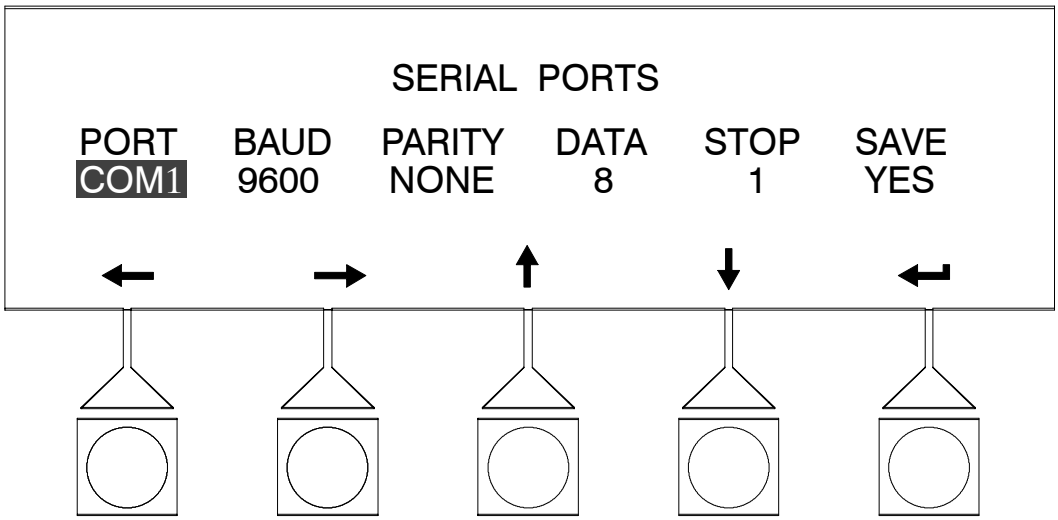


Figure 8–14. Port Setup Screen

Select **VERSIONS** from the System Setup menu to display the Versions screen. The Versions screen provides the firmware version numbers installed on the UPS. Figure 8−15 shows the Versions screen. To return to the System Setup menu screen, select the ↵ pushbutton.

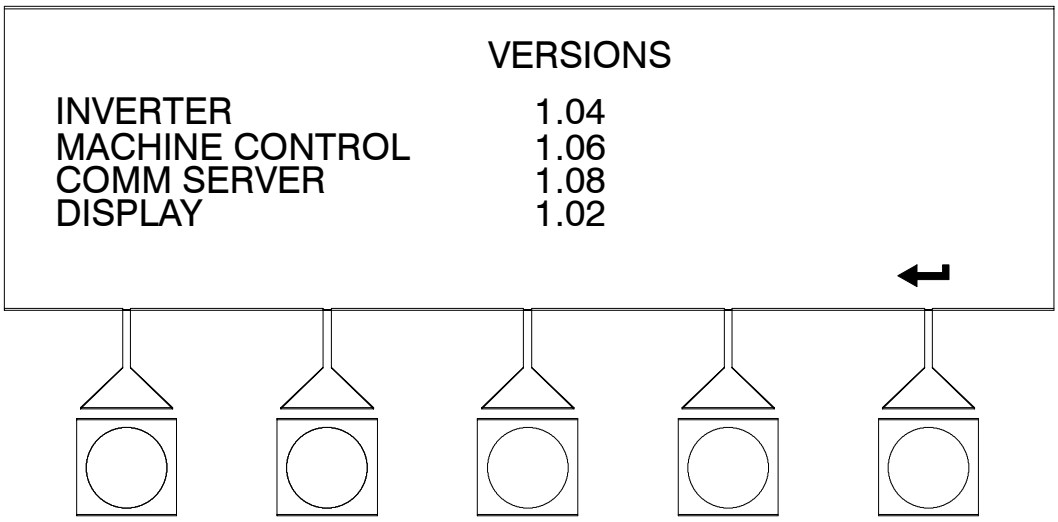


Figure 8−15. Versions Screen

8.4 System Controls Screen

Select **CONTROLS** from the Main menu screen or use the SYSTEM CONTROL pushbutton on the right side of the control panel to display the System Controls screen. Normal operation, transfer to bypass, charger control, and PPU startup and shutdown are controlled from this screen. The PPU pushbutton switch, on the System Controls screen, toggles the PPU On and Off. In addition, the screen displays the current status of the UPS and indicates whether the UPS is in Maintenance Bypass or Bypass, and the state of the Power Processing Unit (PPU) Figures 8–16 and 8–17 show the System Controls screens. For detailed information about using the System Controls, refer to Chapter 9, *"UPS Operating Instructions".*

NOTE: *High Efficiency Mode control option only appears if it has been set by a Customer Service Engineer.*

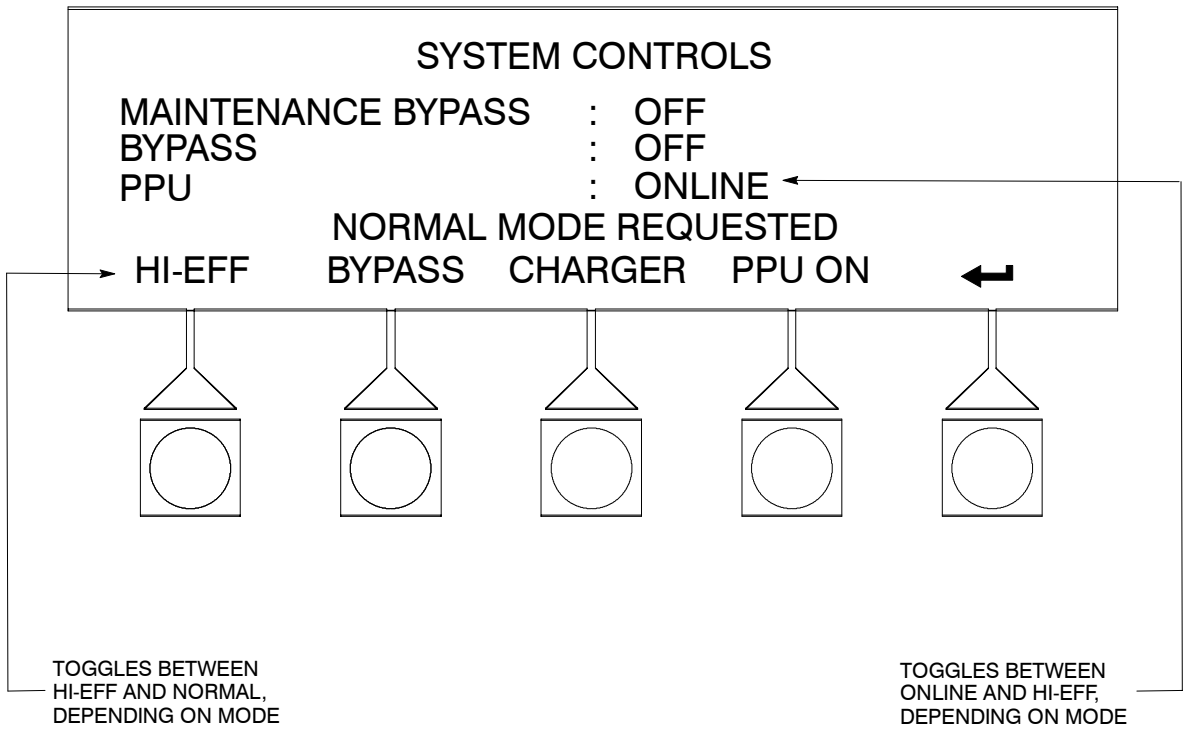


Figure 8–16. System Controls Screen in Normal Mode

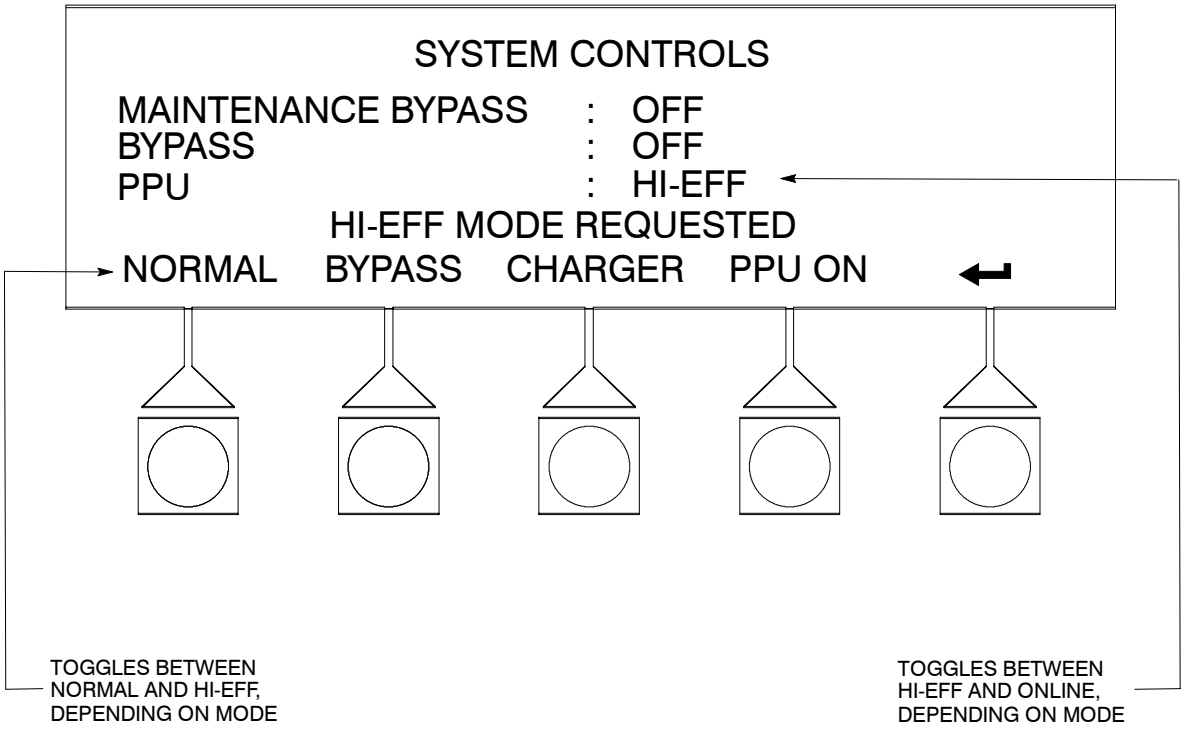

SYSTEM CONTROLS
MAINTENANCE BYPASS : OFF
BYPASS : OFF
PPU : HI-EFF
HI-EFF MODE REQUESTED
NORMAL BYPASS CHARGER PPU ON
TOGGLES BETWEEN NORMAL AND HI-EFF, DEPENDING ON MODE
TOGGLES BETWEEN HI-EFF AND ONLINE, DEPENDING ON MODE

Figure 8–17. System Controls Screen in High Efficiency Mode

8.4.1 Charger Controls Screen

Select **CHARGER** from the System Controls screen to display the Charger Controls screen. Use the controls on this screen to turn the battery charger on and off. Figure 8–18 shows the Charger Controls screen.

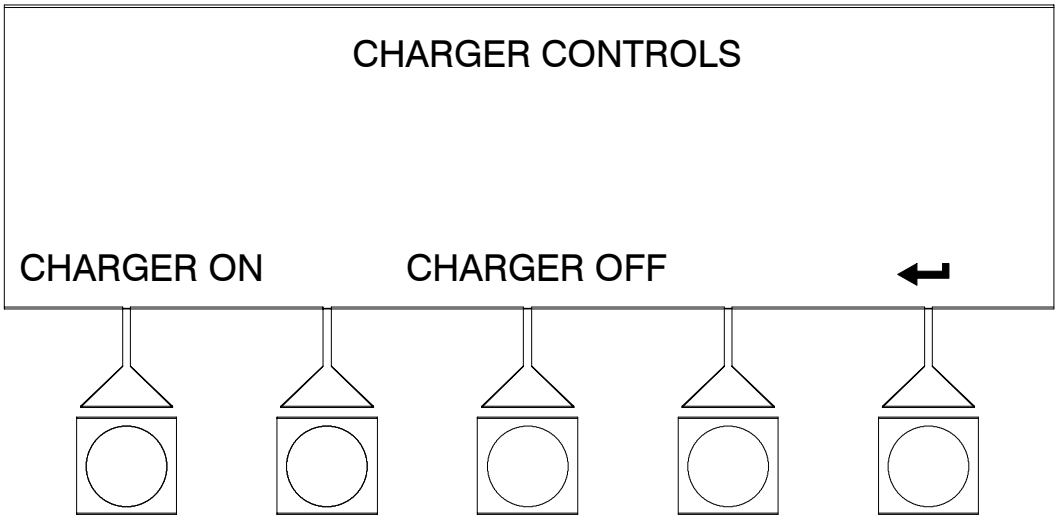


Figure 8–18. Charger Controls Screen

8.5 Unit Shutdown Screen

The Unit Shutdown screen appears when the LOAD OFF pushbutton is pressed. This screen allows the LOAD OFF process to be aborted if the LOAD OFF pushbutton was pressed accidentally. Figure 8–19 shows the Unit Shutdown screen. For detailed information about using the LOAD OFF and Shutdown screen, refer to Chapter 9, *"UPS Operating Instructions".*

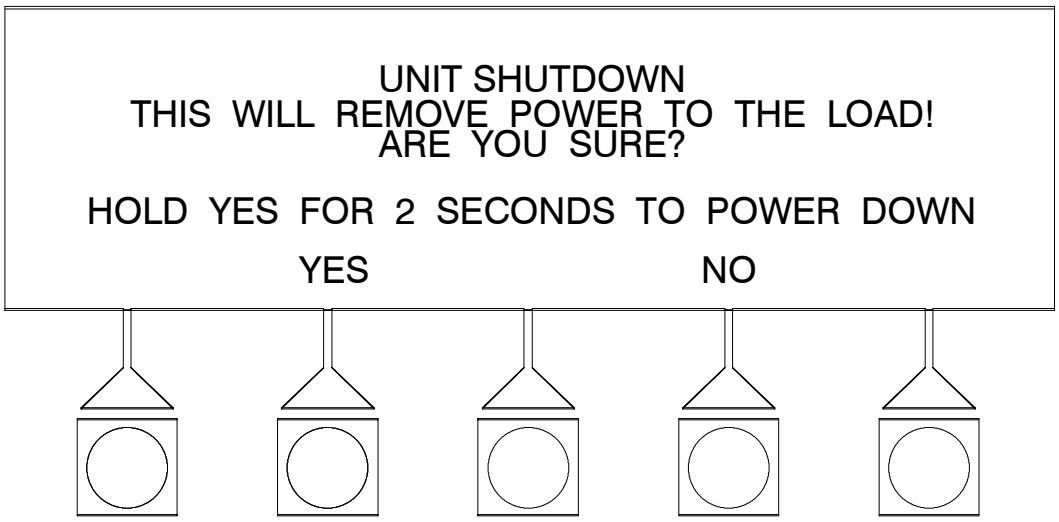
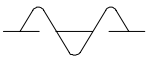


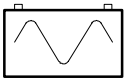
Figure 8–19. Shutdown Screen

8.6 Reading the Status Indicators

The five symbols on the left side of the control panel are *status indicators*. They are backlit by colored light emitting diode (LED) lamps, and they work in conjunction with the alarm horn to let you know the operating status of the UPS.

NORMAL 

This green symbol is lit when the UPS is operating in Normal mode. The power processing unit (PPU) is supplying power to the critical load.

BATTERY 

This yellow symbol is lit when the UPS is operating in Battery mode. Because Battery mode is a normal condition of the UPS, the Normal indicator also remains lit.

BYPASS

This yellow symbol is lit when the UPS is operating in Bypass mode. The critical load is supported by the bypass source. The Normal indicator is not lit when the system is in Bypass mode.

NOTICE

This yellow symbol is lit when the system needs attention. The LCD screen shows all active notices. Some notices may be accompanied by an audible horn. To silence the horn, press the Alarm Off pushbutton switch. The Notice indicator may be lit along with other indicators.

ALARM

This red symbol is lit when a situation requires immediate attention. The LCD screen shows the highest priority active alarms. All alarms are accompanied by an audible horn. To silence the horn, press the Alarm Off pushbutton switch. The Alarm indicator may be lit along with other indicators.

For more information about audible horns, refer to the “System Event Horns” section of Chapter 11.

UPS Operating Instructions

9.1 Operation

The following procedures provide instructions for operating the UPS system. Refer to Chapters 7 and 8 of this manual for a description of the UPS controls and control panel functions.

NOTE: *Before starting the UPS ensure all installation tasks are complete and a preliminary startup has been performed by authorized service personnel. The preliminary startup verifies all electrical interconnections to ensure the installation was successful and the UPS operates properly.*

9.2 Starting the UPS in Normal Mode

To start the UPS system, perform the following procedure:

1. Ensure the UPS circuit breakers and switches are set as follows:

UPS Input Breaker (CB1)	**OPEN**
UPS Battery Breaker (CB2)	**OPEN**
UPS Maintenance Bypass Switch	**UPS**
Options Cabinet Maintenance Bypass Switch (if installed)	**UPS**

2. Close the UPS input feeder circuit breaker.
3. If UPS is dual feed, close UPS Bypass input feeder circuit breaker.
4. If Options cabinet is installed, close Options cabinet Input, Bypass, and Output circuit breakers.
5. Observe UPS monitor screen becoming active as an indication of logic power.
6. Press the System Control pushbutton. The System Control screen appears.
7. On the System Control screen, the PPU status should indicate SHUTDOWN, after approximately 20 seconds
8. On the UPS, close Input breaker CB1.
9. On the UPS, close Battery breaker CB2.
10. If installed, close the Battery breakers on Battery cabinets.
11. Select **NORMAL** or **HI-EFF** from the System Control menu.

    Normal Mode Requested appears on the screen.
    The critical load is immediately supplied by the bypass source, in Bypass mode, until the inverter turns on and the UPS transfers to Normal mode. The status indicator on the UPS Control Panel indicates the UPS is in Bypass mode.

12. Observe the following messages appear sequentially on the PPU status line:

    WAITING FOR INPUT
    DC STARTING
    INVERTER STARTING
    SYNCING
    ONLINE

    The rectifier and inverter turn on. When the inverter reaches full voltage, UPS output contactor K3 closes and the static switch turns off supplying power to the critical load in Normal mode. It takes less than 1 minute for the UPS to achieve Normal mode.

13. The UPS is now operating in the Normal mode and the **NORMAL** status indicator is illuminated.

9.3 Starting the UPS in Bypass Mode

If the Inverter Output of the UPS is not available and the critical load needs to be energized, perform the following procedure:

1. Ensure the UPS circuit breakers and switches are set as follows:

UPS Input Breaker (CB1)	**OPEN**
UPS Battery Breaker (CB2)	**OPEN**
UPS Maintenance Bypass Switch	**UPS**
Options Cabinet Maintenance Bypass Switch (if installed)	**UPS**

2. Close the UPS input feeder circuit breaker.
3. If UPS is dual feed, close UPS Bypass input feeder circuit breaker.
4. If Options cabinet is installed, close Options cabinet Input, Bypass, and Output circuit breakers.
5. Observe UPS monitor screen becoming active as an indication of logic power.
6. Press the System Control pushbutton. The System Control screen appears.
7. On the System Control screen, the PPU status should indicate SHUTDOWN, after approximately 20 seconds
8. Select **BYPASS** from the System Control menu.

    Bypass Mode Requested appears on the screen.
    The critical load is immediately supplied by the bypass source, in Bypass mode.

9. The UPS is now operating in the bypass mode and the **BYPASS** status indicator is illuminated.

9.4 Starting the Power Processing Unit

To start the Power Processing Unit (PPU) without transferring the critical load to normal, perform the following procedure:

1. Ensure the UPS circuit breakers and switches are set as follows:

UPS Input Breaker (CB1)	**OPEN**
UPS Battery Breaker (CB2)	**OPEN**
UPS Maintenance Bypass Switch	**UPS**
Options Cabinet Maintenance Bypass Switch (if installed)	**UPS**

2. Close the UPS input feeder circuit breaker.
3. If UPS is dual feed, close UPS Bypass input feeder circuit breaker.
4. If Options cabinet is installed, close Options cabinet Input, Bypass, and Output circuit breakers.
5. Observe UPS monitor screen becoming active as an indication of logic power.
6. Press the System Control pushbutton. The System Control screen appears.
7. On the System Control screen, the PPU status should indicate SHUTDOWN, after approximately 20 seconds
8. On the UPS, close Input breaker CB1.
9. On the UPS, close Battery breaker CB2.
10. If installed, close the Battery breakers on Battery cabinets.
11. Select **PPU ON** from the System Control menu.

    PPU ON Mode Requested appears on the screen.
    The critical load is immediately supplied by the bypass source, in Bypass mode. The status indicator on the UPS Control Panel indicates the UPS is in Bypass mode.

12. Observe the following messages appear sequentially on the PPU status line:

    WAITING FOR INPUT
    DC STARTING
    INVERTER STARTING
    SYNCING
    READY

    The rectifier and inverter turn on. When the inverter reaches full voltage,the UPS is ready to transfer to the Normal mode and supply the critical load.

13. The UPS is now operating in the Bypass mode and the **BYPASS** status indicator is illuminated.

9.5 Cold Starting the UPS

To start the UPS system when commercial power is not available, perform the following procedure:

NOTE: *Output to the load will be limited to the available energy in the battery supply when the UPS is operated in this mode. In order to continue suppling and protecting the load, the Bypass and/or Rectifier sources should be made available as soon as possible. To ensure that the UPS automatically begins using the Bypass and/or Rectifier sources when commercial power returns, set circuit breakers as instructed in steps 2 through 5.*

1. Ensure the UPS circuit breakers and switches are set as follows:

UPS Input Breaker (CB1)	**OPEN**
UPS Battery Breaker (CB2)	**OPEN**
UPS Maintenance Bypass Switch	**UPS**
Options Cabinet Maintenance Bypass Switch (if installed)	**UPS**

2. Close the UPS input feeder circuit breaker.
3. If UPS is dual feed, close UPS Bypass input feeder circuit breaker.
4. If Options cabinet is installed, close Options cabinet Input, Bypass, and Output circuit breakers.
5. On the UPS, close Input breaker CB1.
6. On the UPS, close Battery breaker CB2.
7. If installed, close the Battery breakers on Battery cabinets.
8. Press and hold Cold Start pushbutton switch while DC Link ramps up and precharges system. Continue to hold pushbutton switch until contactor K2 closes.
9. Observe UPS monitor screen becoming active as an indication of logic power.

   The LCD screen will illuminate and show a graphical representation of the system.
10. Press the System Control pushbutton. The System Control screen appears.
11. On the System Control screen, the PPU status should indicate SHUTDOWN, after approximately 20 seconds

NOTE: *If no operation is selected in step 12, system will shut down after one minute.*

12. Select **NORMAL or HI–EFF** from the System Control menu.

    Normal Mode Requested appears on the screen.
    The status indicator on the UPS Control Panel indicates the UPS is in Normal–Battery mode.

13. Observe the following messages appear sequentially on the PPU status line:

    WAITING FOR INPUT
    DC STARTING
    INVERTER STARTING
    SYNCING
    ONLINE

    The inverter turns on. When the inverter reaches full voltage, UPS output contactor K3 closes supplying power to the critical load in Normal mode. It takes less than 1 minute for the UPS to achieve Normal mode.

14. The UPS is now operating in the Battery mode and the **BATTERY** status indicator is illuminated.

9.6 Transfer from Normal to Bypass Mode

To transfer the critical load to bypass mode, perform the following procedure:

WARNING:
In Bypass Mode, the critical load is not protected from commercial power interruptions and abnormalities.

1. Press the System Control pushbutton. The System Control screen appears.
2. Select **BYPASS** from the System Control menu.

   Bypass Mode Requested appears on the screen.
   The UPS switches to Bypass mode and the critical load is immediately supplied by the bypass source. If the bypass source is not available, the power processor remains on and an alarm sounds.
3. The UPS is now operating in the bypass mode and the **BYPASS** status indicator is illuminated.

   The PPU status indicates READY. System is now on bypass and UPS power processor remains on.

WARNING:
Power is present inside the UPS and Options cabinets.

9.7 Transfer from Bypass to Normal Mode

To transfer the critical load to normal mode, perform the following procedure:

1. Press the System Control pushbutton. The System Control screen appears.
2. Select **NORMAL or HI–EFF** from the System Control menu.

   Normal Mode Requested appears on the screen.
   The UPS switches to Normal mode. If the power processor is not available, the system remains on bypass and an alarm sounds.
3. The UPS is now operating in the Normal mode and the **NORMAL** status indicator is illuminated.

   The PPU status indicates ONLINE.

9.8 Transfer from Normal to High Efficiency Mode

To transfer the UPS from normal mode to high efficiency mode, perform the following procedure:

NOTE: *High Efficiency Mode control option only appears if it has been set by a Customer Service Engineer.*

1. Press the System Control pushbutton. The System Control screen appears.
2. Select **HI-EFF** from the System Control menu.

   Hi-Eff Mode Requested appears on the screen.
   The UPS switches to High Efficiency mode. If bypass is not available, the system remains in normal mode.
3. The UPS is now operating in the High Efficiency mode and the **NORMAL** status indicator is illuminated.

   The PPU status indicates HI-EFF.

9.9 Transfer from High Efficiency to Normal Mode

To transfer the UPS from high efficiency mode to normal mode, perform the following procedure:

NOTE: *High Efficiency Mode control option only appears if it has been set by a Customer Service Engineer.*

1. Press the System Control pushbutton. The System Control screen appears.
2. Select **NORMAL** from the System Control menu.

   Normal Mode Requested appears on the screen.
   The UPS switches to Normal mode. If the power processor is not available, the system remains on bypass and an alarm sounds.
3. The UPS is now operating in the Normal mode and the **NORMAL** status indicator is illuminated.

   The PPU status indicates ONLINE.

9.10 Transfer from Normal to Bypass Mode with UPS Shutdown

1. Transfer critical load to bypass by performing procedure in paragraph 9.6.
2. Press the System Control pushbutton. The System Control screen appears.
3. Toggle **PPU OFF** from the System Control menu.

   The PPU status indicates SHUTDOWN. The input, output, and battery contactors open and the PPU is turned off. The bypass source supplies the critical load.

WARNING:
Power is present inside the UPS and Options cabinets.

9.11 UPS and Critical Load Shutdown

To perform maintenance or service on the critical load, shut down power to the load by performing the following procedure:

1. Turn off all equipment that is being powered by the UPS.
2. Perform **LOAD OFF** procedure contained in paragraph 9.15.1

   The input, output, battery and bypass backfeed contactors open and the PPU is turned off.
3. On the UPS, open Input circuit breaker CB1.
4. On the UPS, open Battery circuit breaker CB2.
5. If installed, open the Battery breakers on Battery cabinets.
6. If Options cabinet is installed, open Options cabinet Input, Bypass, and Output circuit breakers.

WARNING:
Power is present inside the Options cabinet, until the upstream input feeder circuit breaker is opened. Power is present inside the UPS cabinet due to internal batteries.

7. Open the UPS input and bypass (if dual feed) feeder circuit breakers.

9.12 UPS Maintenance Bypass Transfer

To transfer the critical load to Maintenance Bypass, perform the following procedure:

1. Transfer critical load to bypass by performing procedure in paragraph 9.6.
2. Manually set the UPS Maintenance Bypass Switch to **BYPASS**, by turning slowly through the **TEST** position to **BYPASS**.

   The input, output, battery and bypass backfeed contactors open and the PPU is turned off. The maintenance bypass source supplies the critical load.

WARNING:
Power is present inside the UPS and Options cabinets.

9.13 Options Cabinet Maintenance Bypass Transfer

To transfer the critical load to Maintenance Bypass, perform the following procedure:

1. Transfer critical load to bypass by performing procedure in paragraph 9.6.
2. Manually set the Options Cabinet Maintenance Bypass Switch to **BYPASS**, by turning slowly through the **TEST** position to **BYPASS**.

   The input, output, battery and bypass backfeed contactors open and the PPU is turned off. The maintenance bypass source supplies the critical load.

WARNING:
Power is present inside the UPS and Options cabinets.

9.14 Using the Power Distribution Module

If the UPS system contains the optional Power Distribution Module, access to the PDM circuit breakers can be gained by performing the following procedure.

1. Slide the Options cabinet top cover latches to the rear of the cabinet.
2. Lift and secure cover in the upright position using latching slide bar.

9.15 Using the LOAD OFF Pushbutton

An UPS Load Off is initiated by the red **LOAD OFF** pushbutton on the UPS Control Panel. This pushbutton can be pressed to control the UPS output. The UPS **LOAD OFF** pushbutton de-energizes the critical load and powers down the UPS.

The UPS (including Bypass) remains off until restarted.

9.15.1 To Use the LOAD OFF Pushbutton

1. Press the **LOAD OFF** pushbutton.

   The Unit Shutdown screen appears, providing a choice to proceed with the shutdown or to abort the shutdown.

WARNING:
All power to the critical load is lost when *YES* is selected in the following step. You should use this feature only when you want to de-energize the critical load.

2. To shut down the UPS, select **YES** from the Unit Shutdown menu, and hold for two seconds . To abort the shutdown, select **NO**.

   When YES is selected and held for two seconds, the input, output, battery and bypass backfeed contactors open and the PPU is turned off.

CAUTION:
Do not attempt to restart the system after Load Off until the cause of the shutdown has been identified and cleared.

3. To restart the UPS after pressing the **LOAD OFF** pushbutton, follow the procedure, in paragraphs 9.2 or 9.3.

9.16 Using the REMOTE EMERGENCY POWER OFF Switch

An UPS Emergency Power Off is initiated by **Remote Emergency Power OFF (REPO)** pushbutton switch . In an emergency, you can use this switch to control the UPS output. The REPO switch de-energizes the critical load and powers down the UPS immediately, without asking for verification.

The UPS, including Bypass, remains off until restarted.

9.16.1 To Use the REPO Switch

WARNING:
All power to the critical load is lost when this switch is activated. You should use this feature only in an emergency or when you want to de-energize the critical load.

NOTE: *The following instructions are for the Powerware supplied REPO switch. If a customer supplied REPO switch is used it may not activate in the same manner. If this is the case, refer to the operating instructions provided with the switch.*

1. Press the REPO pushbutton switch.

   The input, output, battery and bypass backfeed contactors open and the PPU is turned off immediately, without asking for verification.

CAUTION:
Do not attempt to restart the system after REPO until the cause of the emergency has been identified and cleared.

2. To restart the UPS after using the REPO pushbutton, reset the REPO switch by rotating the switch and then follow the procedure, in paragraphs 9.2 or 9.3.

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Using Features 10

10.1 General

The many standard features of your UPS system provide consistent, economical, and dependable power protection. In addition, you can add available options to enhance the performance of your system. This chapter provides descriptions of the features and options introduced earlier in this manual, but not covered in other chapters. Refer to drawings 164201300−2 and 164201300−8 in Appendix A for location of the customer interface panel and terminals and for terminal wiring information.

10.2 Building Alarm Monitoring

This standard feature lets you connect the UPS to your building alarms, such as smoke detectors or overtemperature alarms. The customer interface terminals for external connections are located inside the UPS.

Regardless of how you assign the building alarms, they display as Building Alarm 1, Building Alarm 2, Building Alarm 3, etc., on the LCD screen of the Monitor Panel. You should use twisted pair wires for each alarm input and common.

10.3 General Purpose Relay Contacts

Two general purpose relay contacts are provided as a standard feature on the UPS. The alarm contacts (one notice and one alarm) are located inside the UPS on the customer interface terminal board.

You can specify that each contact be either normally closed (NC) or normally open (NO). If the state of the contact changes from the state you specify as normal, an signal is issued. You can connect these contacts to equipment at your facility (such as a light or an alarm bell) to let you know when an alarm is active on the UPS. This feature is useful if the UPS is located in a remote area where the UPS alarm horn may not be heard immediately.

CAUTION:
Contacts should not be operated in excess of 120 VAC @ 5A maximum.

10.4 Optional Remote Monitor Panel

As an option, you can install a Remote Monitor Panel (RMP) to monitor the operation of the UPS system from virtually any location within your facility, up to 500 feet from the UPS. The RMP contains backlit status indicators and a local horn. You can surface-mount an RMP on a desktop, secure to a wall, or place in another convenient location. Figure 10−1 shows an RMP.

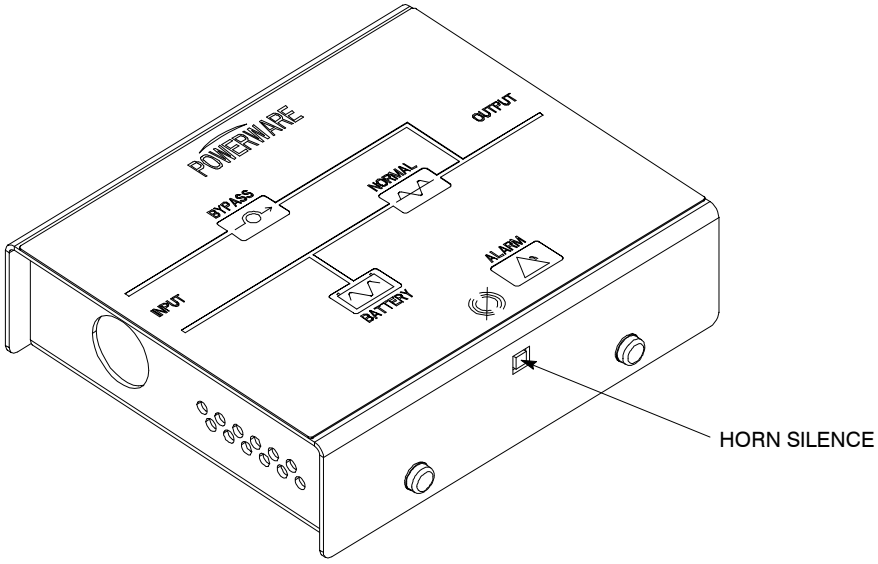
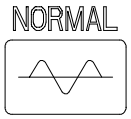


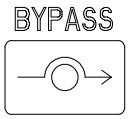
Figure 10−1. Remote Monitor Panel

The RMP contains a local horn and the following backlit status indicators:

NORMAL
The UPS is energized (either with utility power or battery backup) and is supplying conditioned power to the critical load.

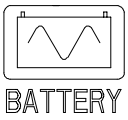


BYPASS
The bypass source is supplying the critical load. Usually this means that the UPS is not energized. The load is not protected in Bypass mode, and a horn sounds after 30 seconds.



ALARM
The UPS system is issuing an alarm. Conditions that affect the current UPS mode are indicated by the alarm lamps and horn on the UPS.

BATTERY
The UPS battery backup is supplying the critical load. The utility power is either interrupted or out of specification. The NORMAL indicator is also lit. After 30 seconds of run time, the alarm indicator will illuminate and a horn sound.



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Responding to System Events 11

11.1 General

When the UPS system is running in Normal mode, it continually monitors itself and the incoming utility power. In Battery or Bypass modes, the UPS may issue alarms to let you know exactly what event caused the change from Normal mode. System events on the UPS can be indicated by horns, lights, messages, or all three.

Select **Events** from the System Event menu on the LCD screen to look at the Active System Events screen. This screen shows any currently active alarms, notices, or commands. (For more information on using the Events screen, refer to paragraph 8.3.2 “System Events Screens of Chapter 8.)

11.2 System Event Horns

The system event horn beeps according to the type of event it is signifying:

- **Horn 1** — The Horn cycles on for 1 second at a one second rate. It is normally used for all Alarm conditions.
- **Horn 2** — The Horn sounds for 3 second every three seconds. It is normally used for all Notice conditions.
- **Horn 3** — The Horn sounds for 5 second every five seconds. It is normally used to prompt the User for action.

11.3 System Event Lights

The status indicators on the UPS Control Panel work in conjunction with the event horn to let you know when the UPS system is operating in any mode other than Normal. Only the Normal indicator is visible during normal UPS system operation. The others light to indicate alarms or events. When an alarm occurs, you should first check these indicators to see what type of event has taken place. (For descriptions of the status indicators, refer to paragraph 8.6 “Reading the Status Indicators” of Chapter 8.)

11.4 System Event Messages

When a system event occurs, a message appears on the LCD screen in the UPS Status area. This message is also is written to the Active Events log and may be added to the Events History Log. The messages are divided into four categories: Alarms, Notices, Status, and Commands. The following tables contain the events displayed on the LCD System Events screen of the Control panel.

ALARMS					
Message	Horn	Phone	Relay	Log	Indication
Battery Over Voltage	1	No	1	HA	Service Required
Battery Over Voltage OK	Off	No	1	HA	Condition Cleared
Battery Time is Low	1	No	1	HA	User Action Required
Battery Time is Low OK	Off	No	1	HA	Condition Cleared
Battery Under Voltage	1	No	1	HA	Shutdown Imminent
Battery Under Voltage OK	Off	No	1	HA	Condition Cleared
Bypass Calibration Required	1	No	1	HA	Service Required
Bypass Calibration Required OK	Off	No	1	HA	Condition Cleared
Bypass Control Failure	1	4	1	A	Service Required
Bypass Overheating Shutdown	1	No	1	HA	User Action Required
Bypass Overheating Shutdown OK	Off	No	1	HA	Condition Cleared
Bypass Overheating Warning	1	No	1	HA	Shutdown Imminent
Bypass Overheating Warning OK	Off	No	1	HA	Condition Cleared
Bypass Phase Rotation	1	No	1	HA	User Action Required
Bypass Phase Rotation OK	Off	No	1	HA	Condition Cleared
Bypass Setup Required	1	No	1	HA	Service Required
Bypass Setup Required OK	Off	No	1	HA	Condition Cleared
Calibrate DC AutoBalance	1	4	1	HA	Service Required
Calibrate DC AutoBalance OK	Off	No	1	HA	Condition Cleared
Charger Failure	1	4	1	HA	Service Required
Charger Failure OK	Off	No	1	HA	Condition Cleared
Check Battery	1	No	1	HA	User Action Required
Check Battery OK	Off	No	1	HA	Condition Cleared
Check Boost	1	4	1	HA	Service Required
Check Boost OK	Off	No	1	HA	Condition Cleared
Check CSB Setup	1	No	1	HA	Service Required
Check CSB Setup OK	Off	No	1	HA	Condition Cleared
Check Inverter	1	No	1	HA	Service Required
Check Inverter OK	Off	No	1	HA	Condition Cleared

ALARMS					
Message	Horn	Phone	Relay	Log	Indication
Check Inverter	1	4	1	HA	Service Required
Check Inverter OK	Off	No	1	HA	Condition Cleared
Check K1	1	No	1	HA	Service Required
Check K1 OK	Off	No	1	HA	Condition Cleared
Check K2	1	4	1	HA	Service Required
Check K2 OK	Off	No	1	HA	Condition Cleared
Check K3	1	4	1	HA	Service Required
Check K3 OK	Off	No	1	HA	Condition Cleared
Check K5	1	4	1	HA	Service Required
Check K5 OK	Off	No	1		Condition Cleared
Check Neutral Regulator	1	4	1	HA	Service Required
Check Neutral Regulator OK	Off	No	1	HA	Condition Cleared
Check Pullchain	1	4	1	HA	Service Required
Check Pullchain OK	Off	No	1	HA	Condition Cleared
DC IN Over Voltage	1	No	1	HA	Service Required
DC IN Over Voltage OK	Off	No	1	HA	Condition Cleared
DC IN Power Supply Failure	1	No	1	HA	Service Required
DC IN Power Supply Failure OK	Off	No	1	HA	Condition Cleared
DC IN Under Voltage	1	No	1	HA	Service Required
DC IN Under Voltage OK	Off	No	1	HA	Condition Cleared
DC Link Unbalance Failure	1	No	1	HA	Service Required
DC Link Unbalance Failure OK	Off	No	1	HA	Condition Cleared
DC Link Voltage Sensing Failure	1	4	1	HA	Service Required
DC Link Voltage Sensing Failure OK	Off	No	1	HA	Condition Cleared
Display Not Responding	1	No	1	HA	Service Required
Display Not Responding OK	Off	No	1	HA	Condition Cleared
Fan Failed 1	1	4	1	HA	Service Required
Fan Failed 1 OK	Off	No	1	HA	Condition Cleared
Fan Failed 2	1	4	1	HA	Service Required
Fan Failed 2 OK	Off	No	1	HA	Condition Cleared
Fast DC Link Under Voltage	1	No	1	HA	Service Required
Fast DC Link Under Voltage OK	Off	No	1	HA	Condition Cleared
Gate Driver Failed 1	1	4	1	HA	Service Required
Gate Driver Failed 1 OK	Off	No	1	HA	Condition Cleared
Heat Sink Thermistor Failure	1	4	1	HA	Service Required
Heat Sink Thermistor Failure OK	Off	No	1	HA	Condition Cleared
Input Failure	1	4	1	HA	Service Required
Input Failure OK	Off	No	1	HA	Condition Cleared

ALARMS					
Message	Horn	Phone	Relay	Log	Indication
Input Phase Rotation	1	No	1	HA	User Action Required
Input Phase Rotation OK	Off	No	1	HA	Condition Cleared
Inverter DC Link OV	1	No	1	HA	Service Required
Inverter DC Link OV OK	Off	No	1	HA	Condition Cleared
Inverter DC Link UV	1	No	1	HA	Service Required
Inverter DC Link UV OK	Off	No	1	HA	Condition Cleared
Inverter Not Responding	2	No	1	HA	Service Required
Inverter Not Responding OK	Off	No	1	HA	Condition Cleared
Inverter Overheating Shutdown	1	No	1	HA	User Action Required
Inverter Overheating Shutdown OK	Off	No	1	HA	Condition Cleared
Inverter Overheating Warning	1	No	1	HA	Shutdown Imminent
Inverter Overheating Warning OK	Off	No	1	HA	Condition Cleared
Inverter Overload	1	No	1	HA	User Action Required
Inverter Setup Required	1	No	1	A	Service Required
Inverter Tripped	1	No	1	A	User Action Required
Inverter Voltage Failure	1	4	1	HA	Service Required
Inverter Voltage Failure OK	Off	No	1	HA	Condition Cleared
Load Over 100%	1	No	1	HA	Shutdown Imminent
Load Over 100% OK	Off	No	1	HA	Condition Cleared
Load Over 125%	1	No	1	HA	Shutdown Imminent
Load Over 125% OK	Off	No	1	HA	Condition Cleared
MCU Not Responding	1	No	1	HA	Service Required
MCU Not Responding OK	Off	No	1	HA	Condition Cleared
Not Enough UPMs	1	No	1	HA	User Action Required
Not Enough UPMs OK	Off	No	1	HA	Condition Cleared
Output Overload 100%	1	No	1	HA	User Action Required
Output Overload 100% OK	Off	No	1	HA	Condition Cleared
Output Overload 125%	1	No	1	HA	User Action Required
Output Overload 125% OK	Off	No	1	HA	Condition Cleared
Output Phase Rotation	1	No	1	HA	User Action Required
Output Phase Rotation OK	Off	No	1	HA	Condition Cleared
Parallel Setup Error	1	4	1	A	Service Required
Parallel Setup Error OK	Off	No	1	A	Condition Cleared
Power Board Sensing Failed 1	1	4	1	HA	Service Required
Power Board Sensing Failed 1 OK	Off	No	1	HA	Condition Cleared
Rectifier Configuration Failure	1	No	1	HA	User Action Required
Rectifier Configuration Failure OK	Off	No	1	HA	Condition Cleared
Rectifier Over Voltage	1	No	1	HA	Service Required
Rectifier Over Voltage OK	Off	No	1	HA	Condition Cleared

ALARMS					
Message	Horn	Phone	Relay	Log	Indication
Rectifier Under Voltage	1	No	1	HA	Service Required
Rectifier Under Voltage OK	Off	No	1	HA	Condition Cleared
SBM Bypass Failed	1	4	1	HA	Service Required
SBM Bypass Failed OK	Off	No	1	HA	Condition Cleared
Scheduled UPS Off Active	1	No	1	HA	User Action Required
Scheduled UPS Off Inactive	1	No	1	HA	User Action Required
Scheduled UPS Off/On Active	1	No	1	HA	User Action Required
Scheduled UPS Off/On Inactive	1	No	1	HA	User Action Required
Scheduled UPS On Active	1	No	1	HA	User Action Required
Scheduled UPS On Inactive	1	No	1	HA	User Action Required
Selective Trip	1	No	1	A	Service Required
Selective Trip OK	Off	No	1	A	Condition Cleared
Shutdown Imminent	1	No	1	HA	User Action Required
Shutdown Imminent Clear	Off	No	1	HA	Condition Cleared
UPS Tripped	1	4	1	A	User Action Required
Warning: Battery Time is Low	1	No	1	HA	User Action Required
Warning: Battery Time is Low OK	Off	No	1	HA	Condition Cleared

Table Key To Log Column

HA – Event recorded in History and Active Logs.

A – Event recorded in Active Log only.

NOTICES					
Message	Horn	Phone	Relay	Log	Indication
ABS: Battery DCUV	1	No	2	HA	Information Only
ABS: Battery DCUV OK	OFF	No	2	HA	Condition Cleared
Battery Current Limit	2	No	2	HA	Information Only
Battery Current Limit OK	Off	No	2	HA	Condition Cleared
Battery Not Present	2	No	2	HA	Information Only
Battery Not Present Clear	Off	No	2	HA	Condition Cleared
Battery Voltage Low	2	No	2	HA	Information Only
Battery Voltage Low OK	Off	No	2	HA	Condition Cleared
Building Alarm 1	1	1	2	HA	Information Only
Building Alarm 1 Clear	Off	No	2	HA	Condition Cleared
Building Alarm 2	2	2	2	HA	Information Only
Building Alarm 2 Clear	Off	No	2	HA	Condition Cleared
Building Alarm 3	3	No	2	HA	Information Only
Building Alarm 3 Clear	Off	3	2	HA	Condition Cleared
Building Alarm 4	3	No	2	HA	Information Only
Building Alarm 4 Clear	Off	4	2	HA	Condition Cleared
Bypass is Not Available	2	No	2	A	Protection Level
Bypass Over Frequency	2	No	2	HA	Information Only
Bypass Over Frequency OK	Off	No	2	HA	Condition Cleared
Bypass Under Frequency	2	No	2	HA	Information Only
Bypass Under Frequency OK	Off	No	2	HA	Condition Cleared
Bypass Over Voltage	2	No	2	HA	Information Only
Bypass Over Voltage OK	Off	No	2	HA	Condition Cleared
Bypass Under Voltage	2	No	2	HA	Information Only
Bypass Under Voltage Ok	Off	No	2	HA	Condition Cleared
Call Connected	2	No	2	HA	Information Only
Call Connected Clear	Off	No	2	HA	Condition Cleared
Call Phone # 1	2	No	2	HA	Information Only
Call Phone # 1 Clear	Off	No	2	HA	Condition Cleared
Call Phone # 2	2	No	2	HA	Information Only
Call Phone # 2 Clear	Off	No	2	HA	Condition Cleared
Call Phone # 3	2	No	2	HA	Information Only
Call Phone # 3 Clear	Off	No	2	HA	Condition Cleared
Call Phone # 4	2	No	2	HA	Information Only
Call Phone # 4 Clear	Off	No	2	HA	Condition Cleared
Calling Unsuccessful	3	No	2	A	Information Only
Calling Phone #1	2	No	2	HA	Information Only
Calling Phone #1 OK	Off	No	2	HA	Condition Cleared

NOTICES					
Message	Horn	Phone	Relay	Log	Indication
Calling Phone #2	2	No	2	HA	Information Only
Calling Phone #2 OK	Off	No	2	HA	Condition Cleared
Calling Phone #3	2	No	2	HA	Information Only
Calling Phone #3 OK	Off	No	2	HA	Condition Cleared
Calling Phone #4	2	No	2	HA	Information Only
Calling Phone #4 OK	Off	No	2	HA	Condition Cleared
Check EPO Reset	2	No	2	A	User Instruction
Check Modem	2	No	2	A	User Instruction
Close Battery	3	No	2	HA	User Instruction
Close Battery OK	Off	No	2	HA	Condition Cleared
Discharging Battery	2	No	2	HA	Information Only
Discharging Battery OK	Off	No	2	HA	Condition Cleared
Emergency Transfer To Bypass	2	No	2	A	Protection Level
Input Over Frequency	2	No	2	HA	Information Only
Input Over Frequency OK	Off	No	2	HA	Condition Cleared
Input Under Frequency	2	No	2	HA	Information Only
Input Under Frequency OK	Off	No	2	HA	Condition Cleared
Input Over Voltage	2	No	2	HA	Information Only
Input Over Voltage OK	Off	No	2	HA	Condition Cleared
Input Under Voltage	2	No	2	HA	Information Only
Input Under Voltage OK	Off	No	2	HA	Condition Cleared
Inverter Initializing	No	No	2	A	Information Only
Maintenance Bypass Off	2	No	2	HA	Protection Level
Maintenance Bypass On	2	No	2	HA	Protection Level
Output Over Frequency	2	No	2	HA	Information Only
Output Over Frequency OK	Off	No	2	HA	Condition Cleared
Not Enough UPMS	1	No	2	A	Information Only
Not Enough UPMS OK	Off	No	2	A	Condition Cleared
Output Under Frequency	2	No	2	HA	Information Only
Output Under Frequency OK	Off	No	2	HA	Condition Cleared
Output Over Voltage	2	No	2	HA	Information Only
Output Over Voltage OK	Off	No	2	HA	Condition Cleared
Output Under Voltage	2	No	2	HA	Information Only
Output Under Voltage OK	Off	No	2	HA	Condition Cleared
Phone #1 Failed	3	No	2	A	Information Only
Phone #2 Failed	3	No	2	A	Information Only
Phone #3 Failed	3	No	2	A	Information Only
Phone #4 Failed	3	No	2	A	Information Only
SBM IO 1 Not Reporting	1	No	2	A	Information Only
SBM IO Not Reporting OK	Off	No	2	A	Condition Cleared

NOTICES					
Message	Horn	Phone	Relay	Log	Indication
SBM IO 2 Not Reporting	1	No	2	A	Information Only
SBM IO Not Reporting OK	Off	No	2	A	Condition Cleared
UPM 1 Not Reporting	1	No	2	A	Information Only
UPM 1 Not Reporting OK	Off	No	2	A	Condition Cleared
UPM 2 Not Reporting	1	No	2	A	Information Only
UPM 2 Not Reporting OK	Off	No	2	A	Condition Cleared
UPM 3 Not Reporting	1	No	2	A	Information Only
UPM 3 Not Reporting OK	Off	No	2	A	Condition Cleared
UPM 4 Not Reporting	1	No	2	A	Information Only
UPM 4 Not Reporting OK	Off	No	2	A	Condition Cleared
UPS MOB Open	1	No	2	A	Service Status
UPS MOB Open OK	Off	No	2	A	Condition Cleared

System Not Redundant

Table Key To Log Column

HA – Event recorded in History and Active Logs.

A – Event recorded in Active Log only.

STATUS					
Message	Horn	Phone	Relay	Log	Indication
Alarm Lamp	No	No	1	No	Service Status
Auto Mode	No	No	No	A	User Status
Bypass is Available	No	No	No	A	User Status
Charger On	No	No	No	HA	Service Status
Charger Off	No	No	No	HA	Service Status
CSB Power Supply on	No	No	No	A	Service Status
Hi−Eff Mode	No	No	No	No	User Status
Inverter On	No	No	No	HA	Service Status
Inverter Off	No	No	No	HA	Service Status
Inverter Under Voltage	1	No	No	HA	Service Status
Inverter Under Voltage OK	Off	No	No	HA	Service Status
K1 (Input) Closed	No	No	No	HA	Service Status
K1 (Input) Open	No	No	No	HA	Service Status
K2 (Battery) Closed	No	No	No	HA	Service Status
K2 (Battery) Open	No	No	No	HA	Service Status
K3 (Inverter) Closed	No	No	No	HA	Service Status
K3 (Inverter) Open	No	No	No	HA	Service Status
K5 (Backfeed) Closed	No	No	No	HA	Service Status
K5 (Backfeed) Open	No	No	No	HA	Service Status
Modem OK	No	No	No	A	User Status
Notice Lamp	No	No	2	No	Service Status
On Battery	No	No	No	A	User Status
On Bypass	No	No	No	A	User Status
PPU Shutdown	No	No	No	A	User Status
SBM Bypass	No	No	No	A	User Status
Unit Normal	No	No	No	A	User Status
UPS Power Supply	No	No	No	HA	Service Status
UPS Power Supply OK	No	No	No	HA	Service Status

Table Key To Log Column

HA – Event recorded in History and Active Logs.

A – Event recorded in Active Log only.

COMMANDS					
Message	Horn	Phone	Relay	Log	Indication
Bypass Mode	No	No	No	A	
Hi–Eff On	No	No	No	A	
Hi–Eff Off	No	No	No	A	
Load Off	No	No	No	A	
Normal Mode	No	No	No	A	
PPU On	No	No	No	A	
PPU Off	No	No	No	A	

Table Key To Log Column

HA – Event recorded in History and Active Logs.

A – Event recorded in Active Log only.

Communications 12

12.1 Description

This chapter describes the serial communications feature of the Powerware® 9330 10 kVA–20 kVA and 25 kVA–40 kVA UPS. One serial communications port on the UPS allows you to connect equipment to view system event information.

The following sections describe the serial communications feature, and provide information about connecting hardware, and using terminal mode.

12.2 Communications and Expansion Ports

The the rear of the UPS contains one DB–9 Serial Communications Port. The port provides a computer interface to a remote terminal and/or printer. The the rear of the UPS also contains a 120 VAC, .2A convenience outlet for powering a modem used for remote notification. In addition, expansion slots are provided to extend customer communications options (refer to Chapter 7 "Operational Controls and Features", for a description of the available options). Refer to Appendix A for location of the Customer Interface Panel on the UPS.

12.3 Connecting Equipment to a Serial Port

The UPS is designed to accept a wide variety of Data Communication Equipment (DCE) such as terminals, printers, and computers to the serial port. Set up the remote equipment using the appropriate parameters for the mode you select. The following section provides more information about configuration.

The cable you use for connection depend on the equipment you are connecting to the UPS. The Cable should be no longer than 16m (50 ft). The connector for the Serial Communications Port in the UPS is female, so the cable connecting to the UPS should be male. Figure 12–1 shows the pin assignments for Serial Port, and Table 12–1 describes them.

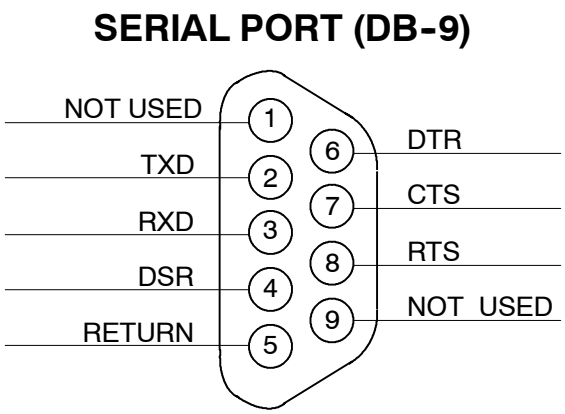

Figure 12–1. Serial Port Pin Assignments

Table 12–1. Pin Assignments for Serial Port (DB–9)			
Pin #	**Symbol**	**Description**	**Comments**
2	TXD	Transmit Data	Input to UPS
3	RXD	Receive Data	Output from UPS
4	DSR	Data Set Ready	
5	RTN	Return	
6	DTR	Data Terminal Ready	
7	CTS	Clear to Send	
8	RTS	Ready to Send	

12.4 Configuring the Serial Ports

Table 12–2 lists the default configuration settings for the serial communications port.

Table 12–2. Serial Communications Port				
Baud	Data Bits	Stop Bit	Parity	Handshaking
9600	8	1	No	Disabled

The serial port is pre-configured and can not be changed.

Terminal Mode and Remote Notification Mode (refer to Chapter 13, “Remote Notification) are available using the serial communications port.

12.5 Terminal Mode

In Terminal Mode, the user can request the following:

NOTE: *The brackets ([ ]) in the following bullets indicate standard keyboard characters.*

To use a key combination, hold down the Escape key and press the indicated letter key.

- Display UPS Control Panel by pressing and holding [ESC], then press [V].
- Display Event History by pressing and holding [ESC], then press [H].
- Display Node Bits Setup by pressing and holding [ESC], then press [N].
- Display any new event by pressing and holding [ESC], then press [L].

12.5.1 Display UPS Control Panel

When this function is invoked, a facsimile of the UPS Control Panel is displayed on the terminal screen. All controls are functional and will control the UPS remotely. The only exception is the Load Off control which requires the operator to press and hold the local control for two seconds to shutdown the UPS.

To remotely control the UPS or view UPS information, use the escape key legend to control the function normally controlled by the Control Panel softkeys. Refer to Chapter 8 “Using the Control Panel” for instructions on navigating the control panel.

Figures 12−2 through 12−17 show the typical screens using this function.

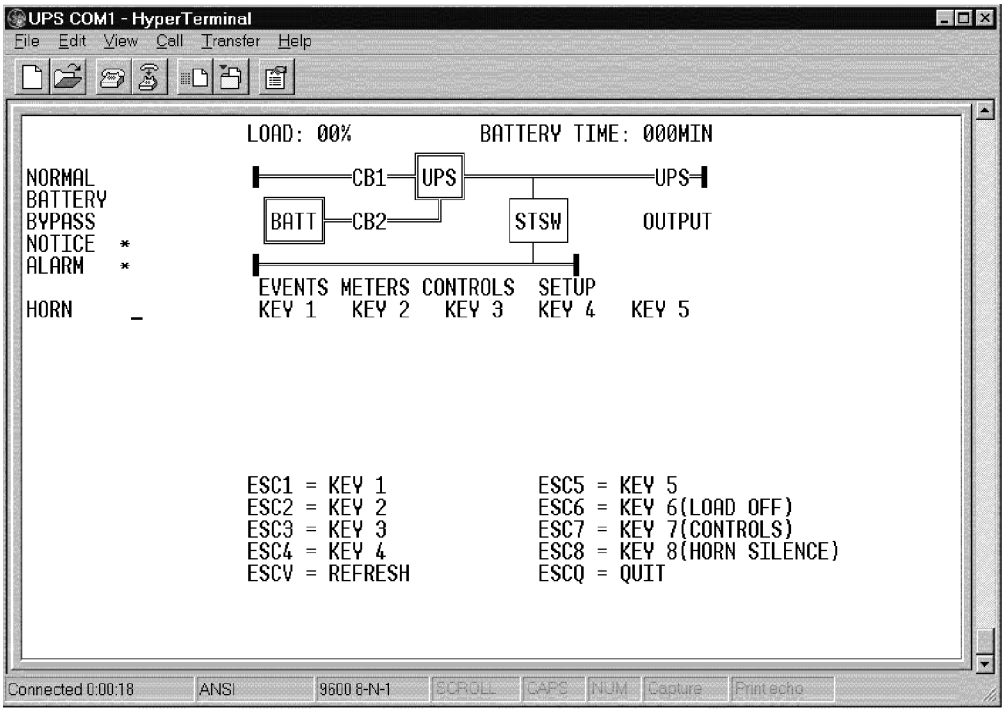

Figure 12−2. Main Screen − UPS Normal Mimic

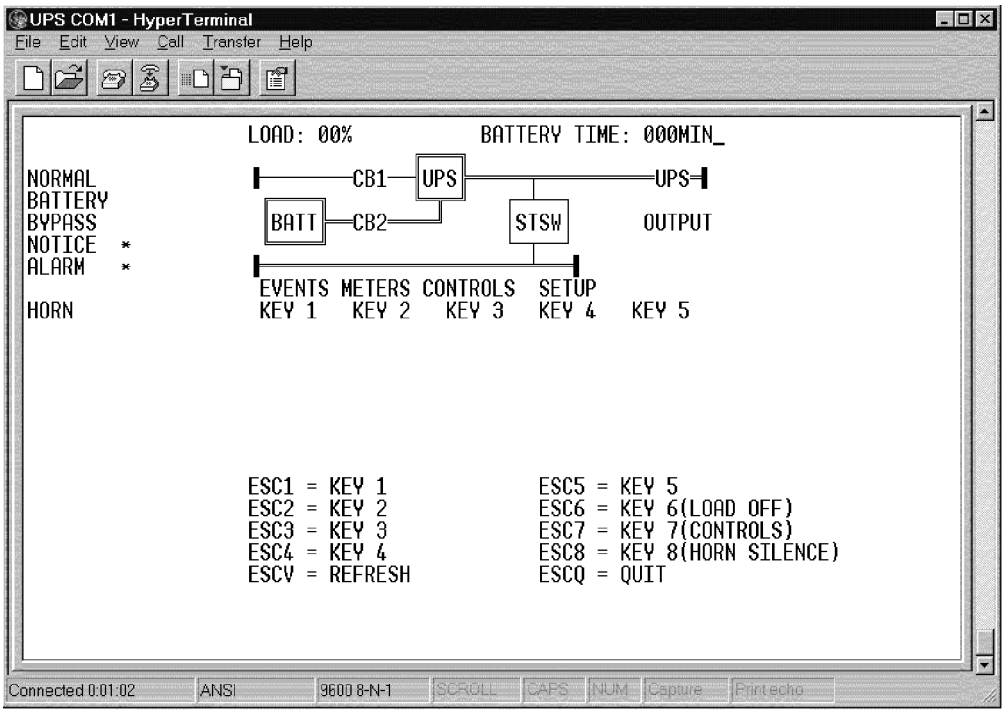

Figure 12–3. Main Screen – UPS On Battery Mimic

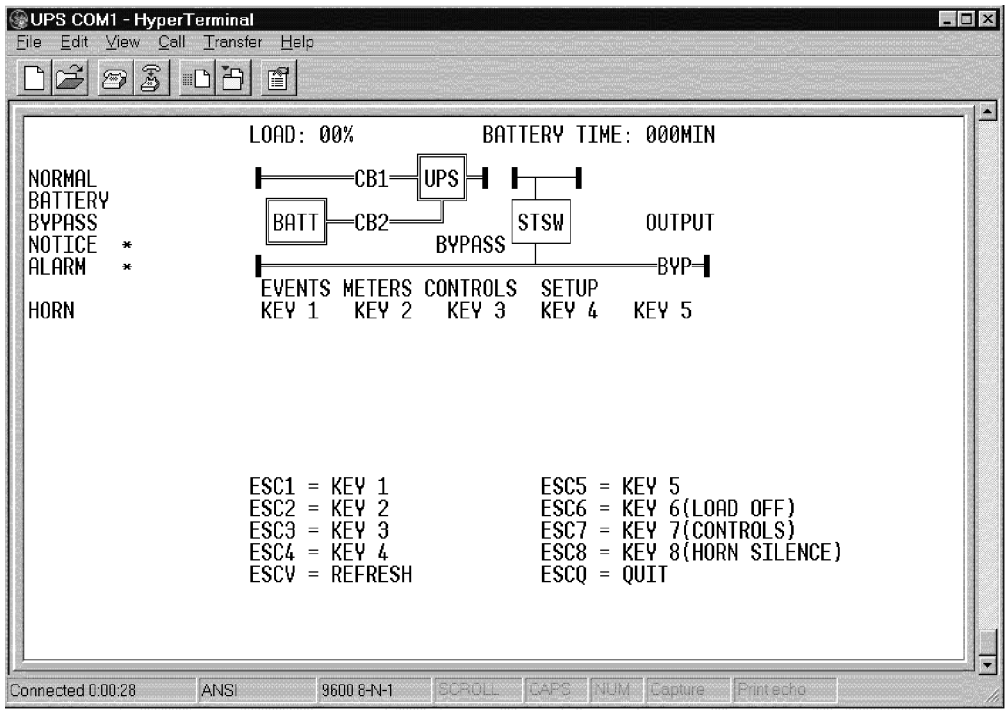

Figure 12–4. Main Screen – UPS On Bypass Mimic

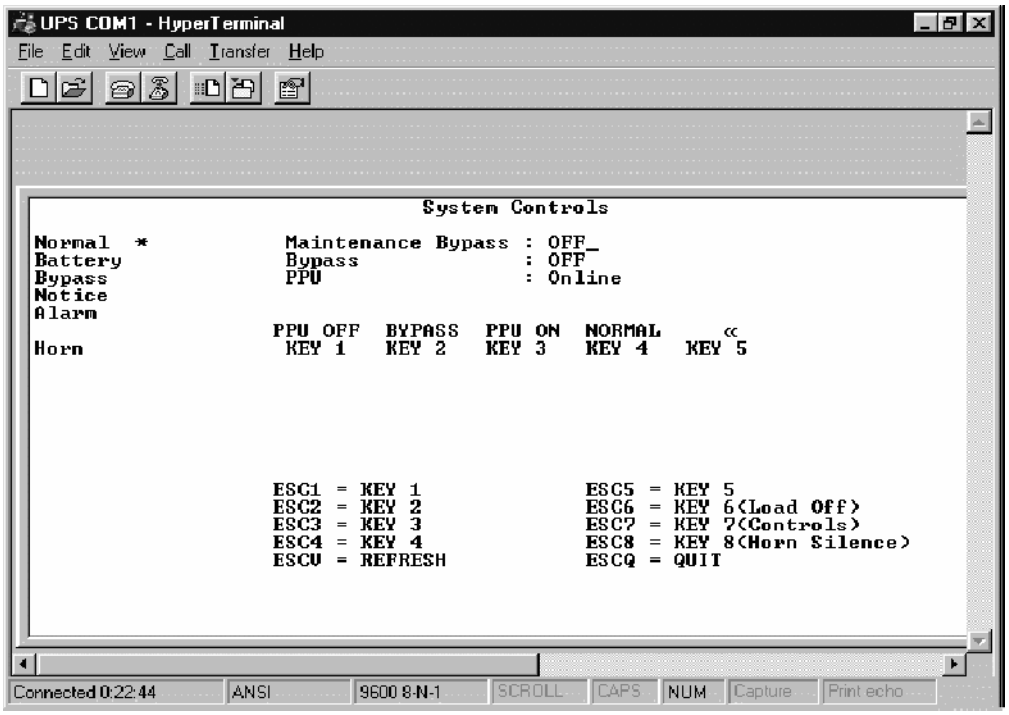

Figure 12–5. System Controls

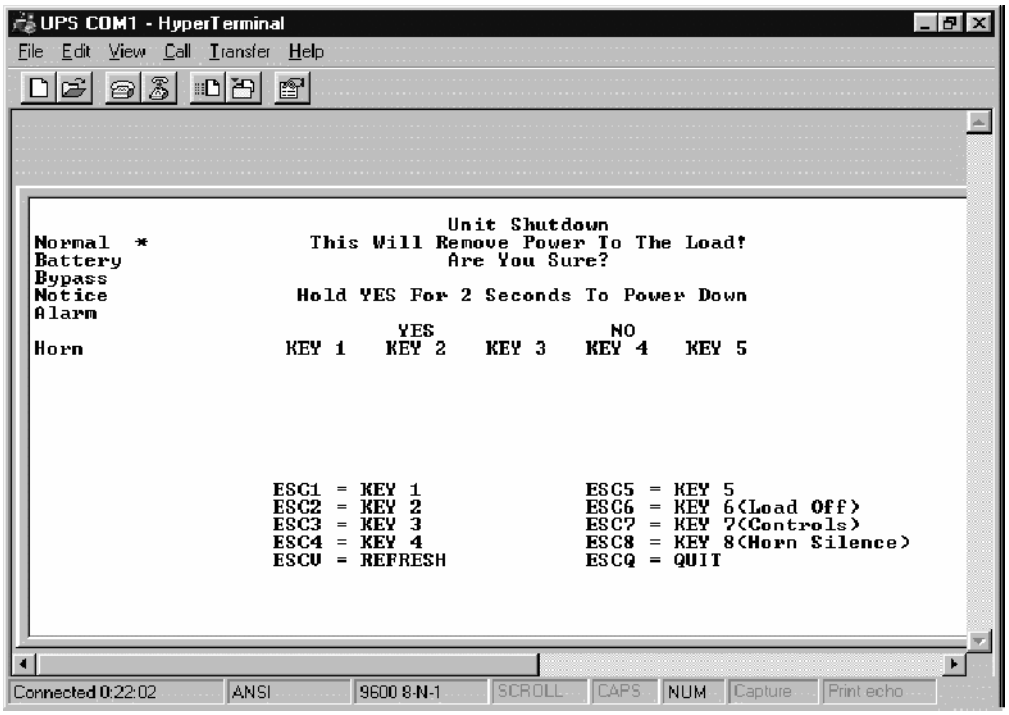

Figure 12–6. Load Off

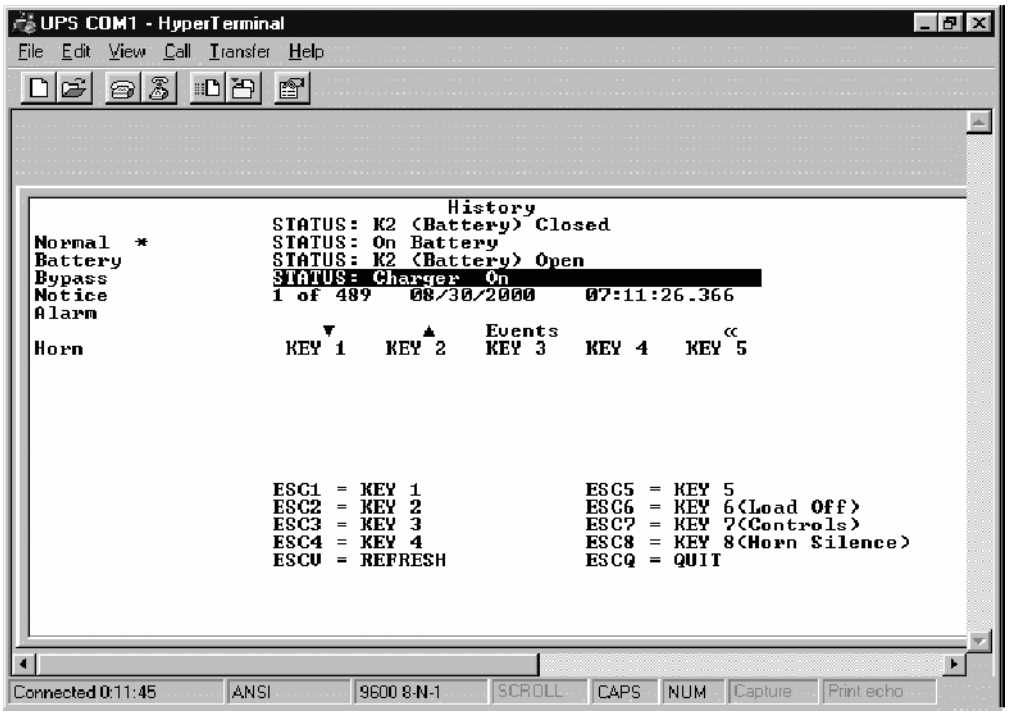

Figure 12–7. Events – History

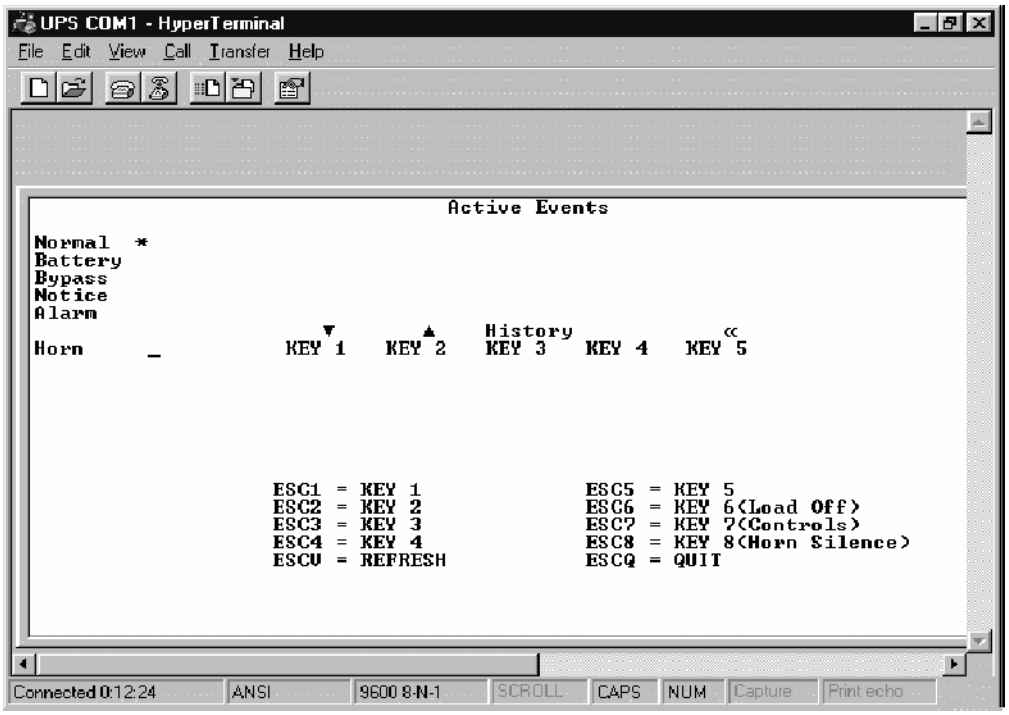

Figure 12–8. Events – Active

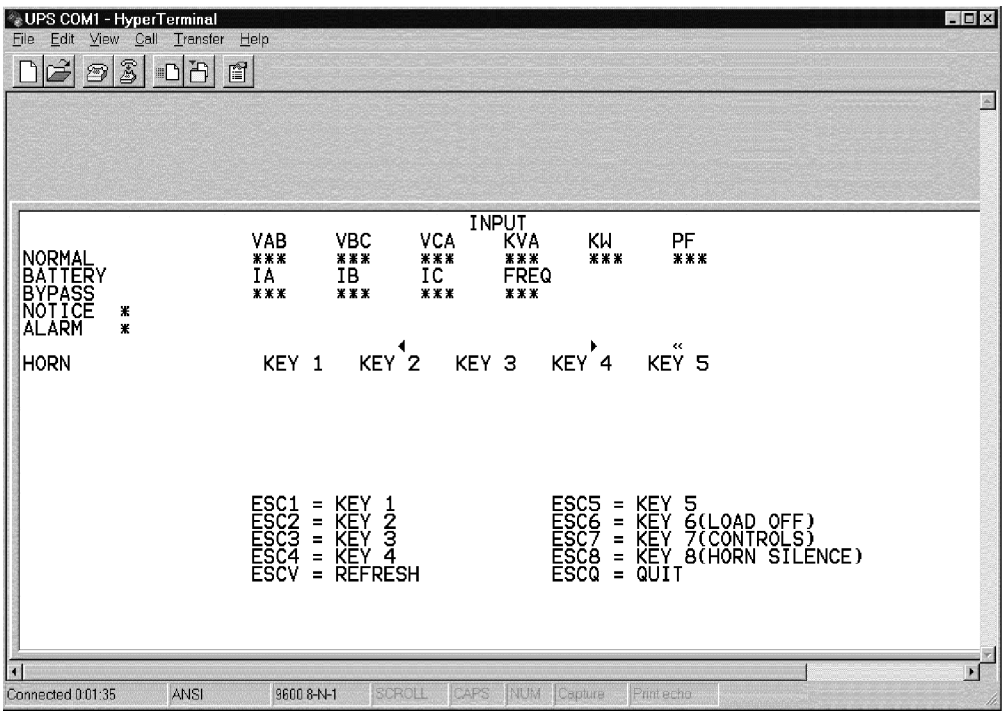
UPS COM1 - HyperTerminal
File Edit View Call Transfer Help
INPUT
VAB VBC VCA KVA KW PF
NORMAL *** *** *** *** *** ***
BATTERY IA IB IC FREQ
BYPASS *** *** *** ***
NOTICE *
ALARM *
HORN KEY 1 KEY 2 KEY 3 KEY 4 KEY 5
ESC1 = KEY 1
ESC2 = KEY 2
ESC3 = KEY 3
ESC4 = KEY 4
ESCV = REFRESH
ESC5 = KEY 5
ESC6 = KEY 6(LOAD OFF)
ESC7 = KEY 7(CONTROLS)
ESC8 = KEY 8(HORN SILENCE)
ESCQ = QUIT
Connected 0:01:35 ANSI 9600 8-N-1 SCROLL CAPS NUM Capture Print echo

Figure 12–9. Input Meter

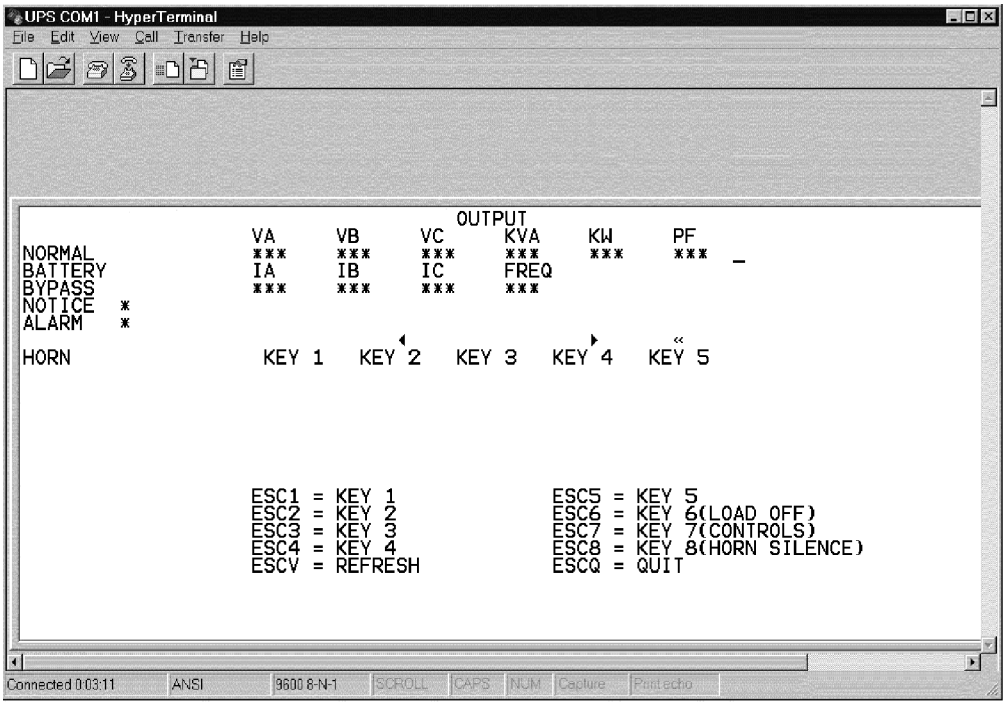
UPS COM1 - HyperTerminal
File Edit View Call Transfer Help
OUTPUT
VA VB VC KVA KW PF
NORMAL *** *** *** *** *** ***
BATTERY IA IB IC FREQ
BYPASS *** *** *** ***
NOTICE *
ALARM *
HORN KEY 1 KEY 2 KEY 3 KEY 4 KEY 5
ESC1 = KEY 1
ESC2 = KEY 2
ESC3 = KEY 3
ESC4 = KEY 4
ESCV = REFRESH
ESC5 = KEY 5
ESC6 = KEY 6(LOAD OFF)
ESC7 = KEY 7(CONTROLS)
ESC8 = KEY 8(HORN SILENCE)
ESCQ = QUIT
Connected 0:03:11 ANSI 9600 8-N-1 SCROLL CAPS NUM Capture Print echo

Figure 12–10. Output Meter

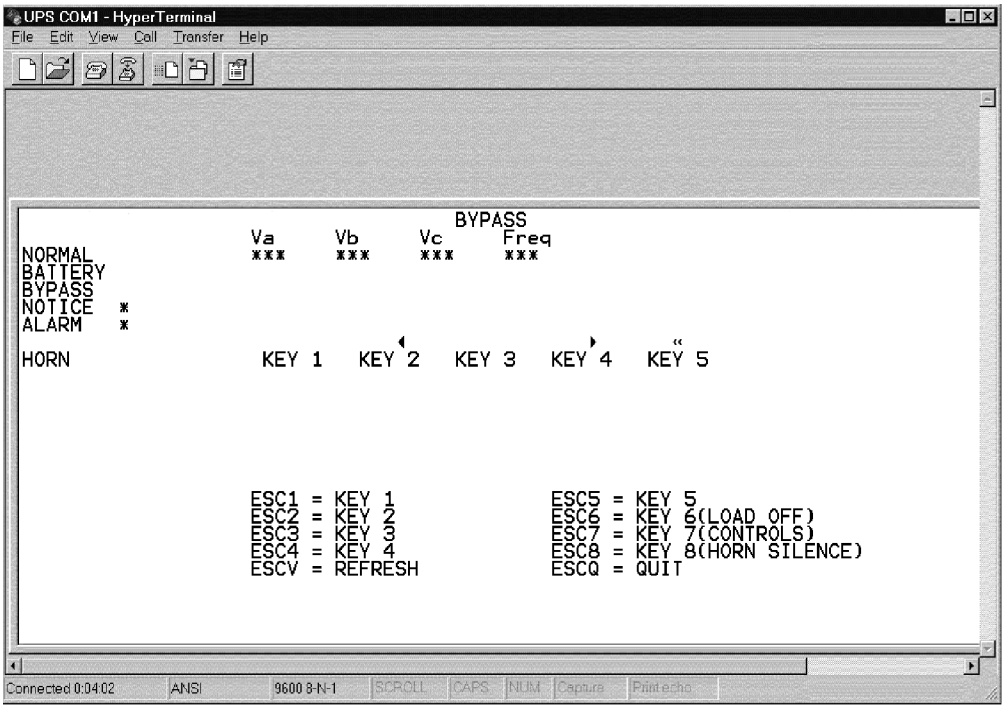
UPS COM1 - HyperTerminal
File Edit View Call Transfer Help
BYPASS
Va Vb Vc Freq
NORMAL *** *** *** ***
BATTERY
BYPASS
NOTICE *
ALARM *
HORN KEY 1 KEY 2 KEY 3 KEY 4 KEY 5
ESC1 = KEY 1
ESC2 = KEY 2
ESC3 = KEY 3
ESC4 = KEY 4
ESCV = REFRESH
ESC5 = KEY 5
ESC6 = KEY 6(LOAD OFF)
ESC7 = KEY 7(CONTROLS)
ESC8 = KEY 8(HORN SILENCE)
ESCQ = QUIT
Connected 0:04:02 ANSI 9600 8-N-1 SCROLL CAPS NUM Capture Print echo

Figure 12–11. Bypass Meter

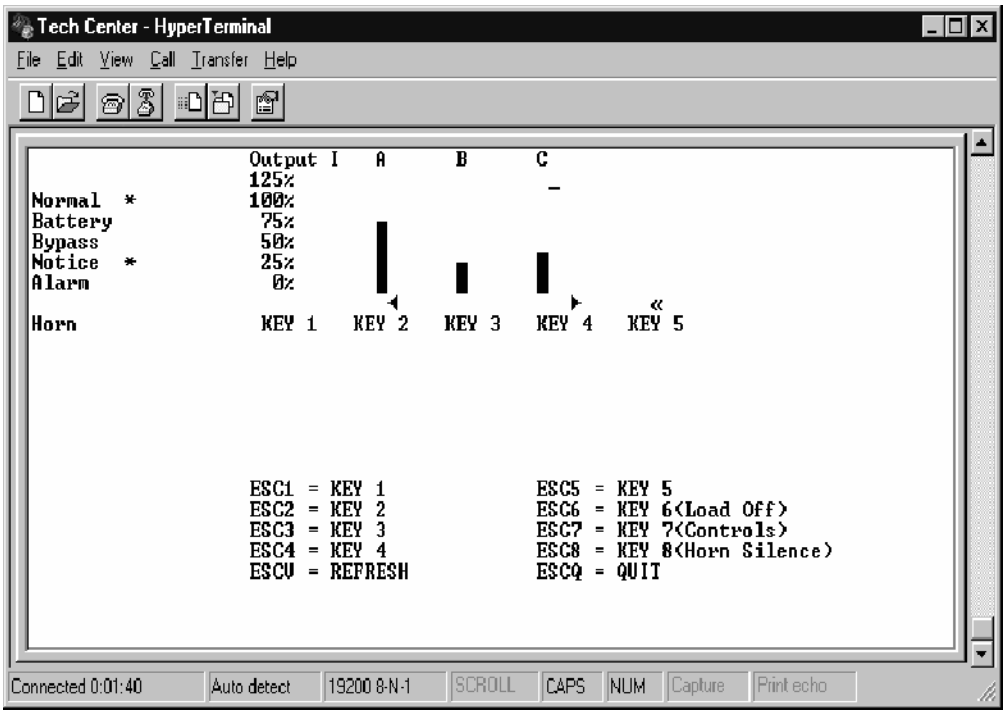
Tech Center - HyperTerminal
File Edit View Call Transfer Help
Output I A B C
125%
Normal * 100%
Battery 75%
Bypass 50%
Notice * 25%
Alarm 0%
Horn KEY 1 KEY 2 KEY 3 KEY 4 KEY 5
ESC1 = KEY 1
ESC2 = KEY 2
ESC3 = KEY 3
ESC4 = KEY 4
ESCV = REFRESH
ESC5 = KEY 5
ESC6 = KEY 6(Load Off)
ESC7 = KEY 7(Controls)
ESC8 = KEY 8(Horn Silence)
ESCQ = QUIT
Connected 0:01:40 Auto detect 19200 8-N-1 SCROLL CAPS NUM Capture Print echo

Figure 12–12. Output Current (Load) Meter

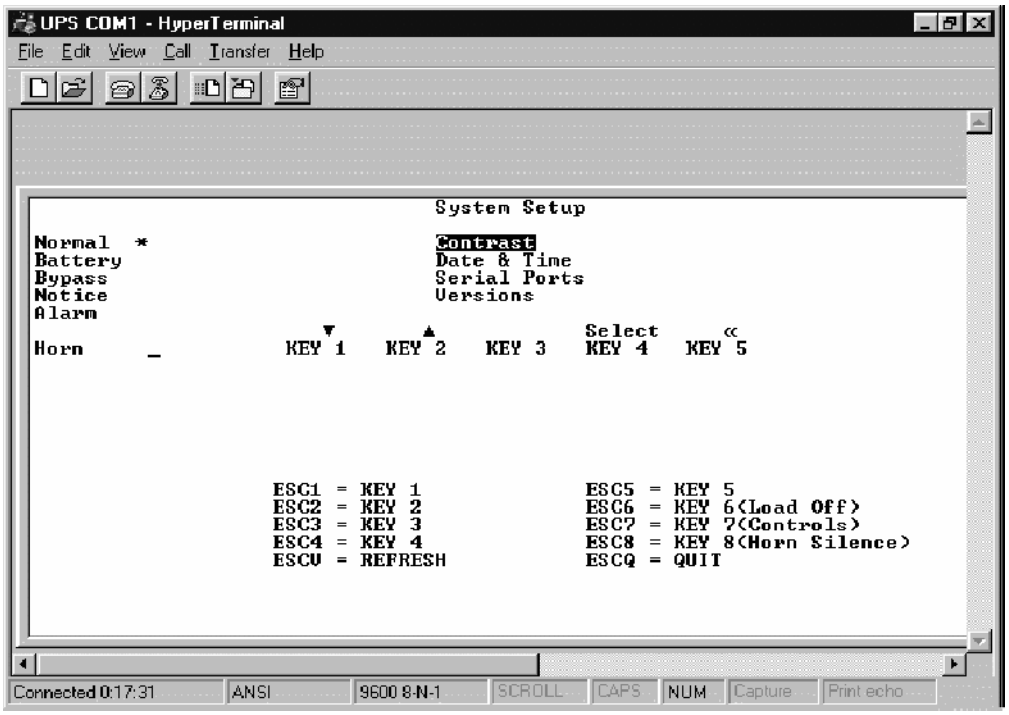

Figure 12–13. Setup

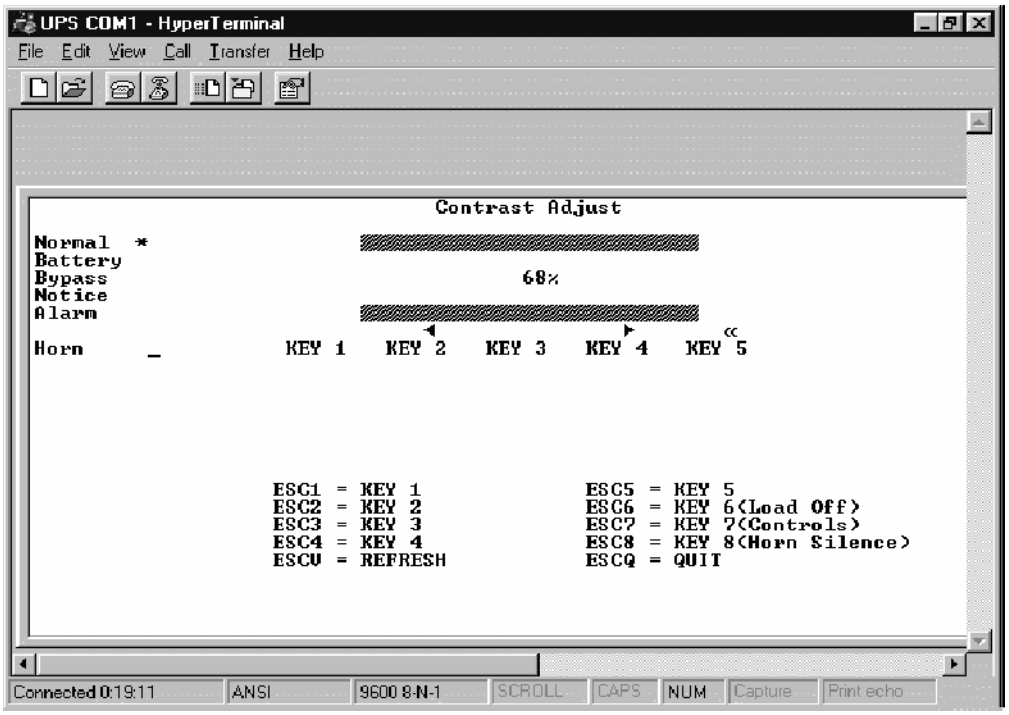

Figure 12–14. Contrast Adjust

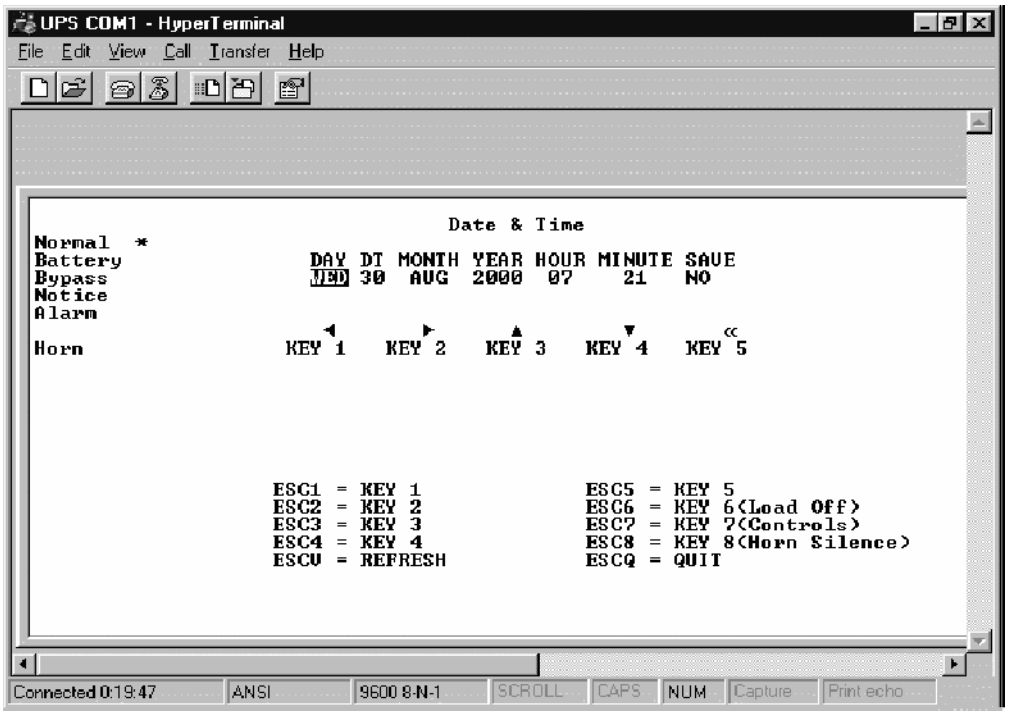

Figure 12–15. Date and Time Setup

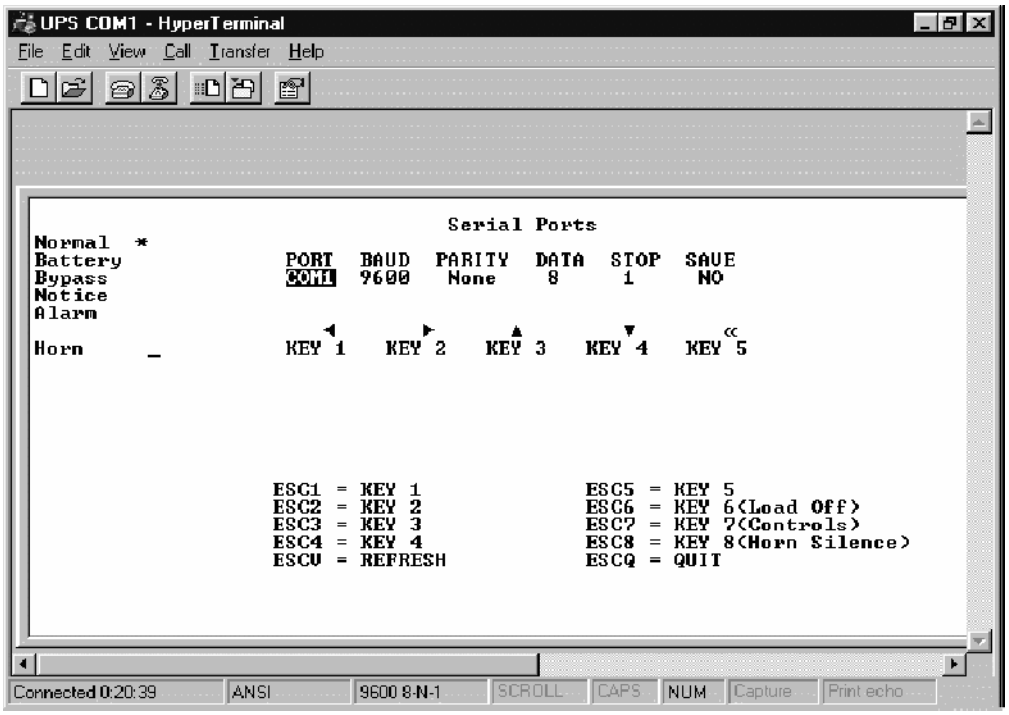

Figure 12–16. Serial Port Setup

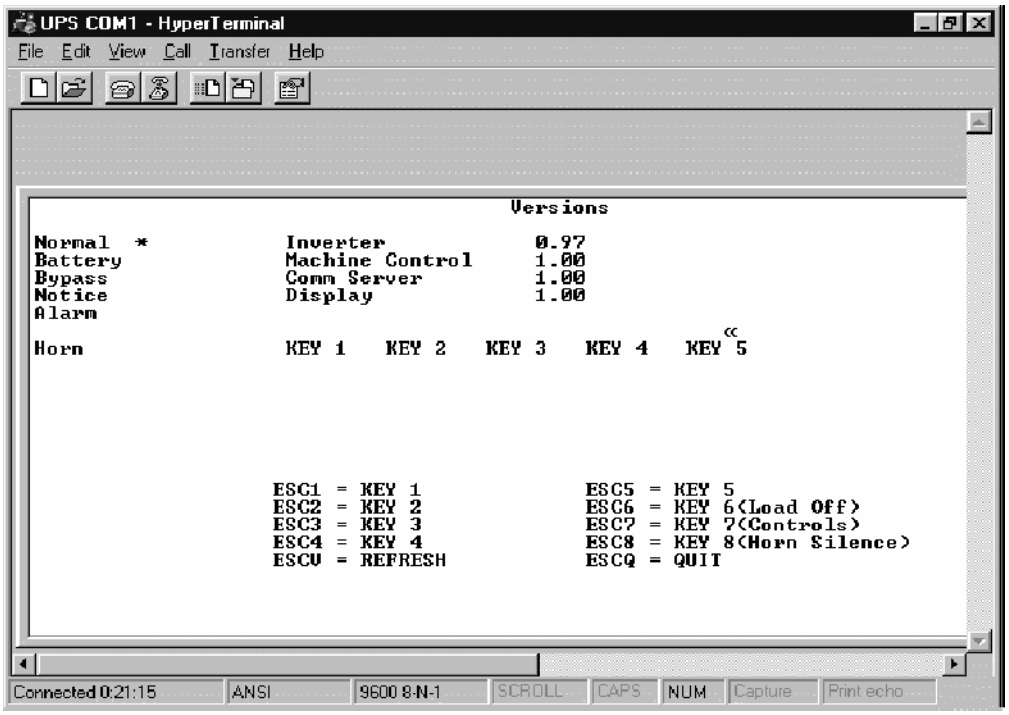

Figure 12–17. Versions

12.5.2 Event History Log

This key sequence prints the entire Event History Log of the UPS at the time the data is requested. The printout begins with the oldest alarm entry in the queue and ends with the most recent. Any alarms that occur while the Event History Log is printing are included in chronological order.

The Event History Log lists up to 500 system events in chronological order with the most recent event listed last. Figure 12−18 shows a sample Event History Log printout.

In this mode, system events are continually logged through the serial port to the device connected to the port.

The printed log entries contain a time and date stamp and the alarm text message. Terminal mode uses this format for printing alarm entries:

MM DD YYYY HH:MM:SS.hh KYWD MESSAGE ✳✳✳✳ <CR> <LF>

Symbol	*Description*
MM	Month (2 digits)
YYYY	Year (4 digits)
DD	Day (2 digits)
HH	Hour (2 digits)
MM	Minute (2 digits)
SS	Second (2 digits)
hh	Hundredths of Second (2 digits)
KYWD	Keyword (ALARM, NOTICE, COMMAND, or STATUS)
✳✳✳✳	System Diagnostic Information
<CR>	Carriage Return Character (ASCII 13)
<LF>	Line Feed (ASCII 10)

An alarm message is prefixed by the word “CLEAR” whenever an alarm is entered into the Event History Log with a cleared status.

If a port is operating in Terminal mode and is connected to a computer, you can use key combinations at any time to print selected information:

Esc+H Prints the entire log with a firmware version header

To use a key combination, hold down the Esc key and press the letter key.

Inverter Version 0.97
Machine Control Version 0.99
Comm Server Version 0.98
Display Version 0.96

08/11/2000 14:13:03.000 STATUS: CSB Power Supply On
08/11/2000 14:13:03.043 NOTICE: Inverter Initializing
08/11/2000 14:13:05.721 STATUS: UPS Power Supply OK
08/11/2000 14:13:05.728 NOTICE: Input Under Voltage
08/11/2000 14:13:05.729 NOTICE: Output Under Voltage
08/11/2000 14:13:05.729 NOTICE: Bypass Under Voltage
08/11/2000 14:13:05.749 ALARM: Rectifier Under Voltage
08/11/2000 14:13:10.459 ALARM: Battery Under Voltage
08/11/2000 14:13:12.954 NOTICE: Battery Voltage Low
08/11/2000 14:13:13.165 NOTICE: Battery Not Present
08/11/2000 14:13:34.710 STATUS: PPU Shutdown
08/11/2000 14:13:57.773 NOTICE: Check Modem
08/11/2000 14:14:33.520 ALARM: Inverter Tripped
08/11/2000 14:14:33.520 ALARM: Check Inverter
08/11/2000 14:27:09.000 STATUS: CSB Power Supply On
08/11/2000 14:27:09.043 NOTICE: Inverter Initializing
08/11/2000 14:27:11.725 STATUS: UPS Power Supply OK
08/11/2000 14:27:11.733 NOTICE: Input Under Voltage
08/11/2000 14:27:11.733 NOTICE: Output Under Voltage
08/11/2000 14:27:11.733 NOTICE: Bypass Under Voltage
08/11/2000 14:27:11.754 ALARM: Rectifier Under Voltage
08/11/2000 14:27:16.464 ALARM: Battery Under Voltage
08/11/2000 14:27:18.954 NOTICE: Battery Voltage Low
08/11/2000 14:27:19.169 NOTICE: Battery Not Present
08/11/2000 14:27:40.714 STATUS: PPU Shutdown
08/11/2000 14:28:04.023 NOTICE: Check Modem
08/12/2000 14:15:09.000 STATUS: CSB Power Supply On
08/12/2000 14:15:09.043 NOTICE: Inverter Initializing
08/12/2000 14:15:11.725 STATUS: UPS Power Supply OK
08/12/2000 14:15:11.733 NOTICE: Input Under Voltage
08/12/2000 14:15:11.733 NOTICE: Output Under Voltage
08/12/2000 14:15:11.754 ALARM: Rectifier Under Voltage
08/12/2000 14:15:11.833 NOTICE: Maintenance Bypass On
08/12/2000 14:15:16.463 ALARM: Battery Under Voltage
08/12/2000 14:15:18.954 NOTICE: Battery Voltage Low
08/12/2000 14:15:19.169 NOTICE: Battery Not Present
08/12/2000 14:15:40.714 STATUS: PPU Shutdown
08/12/2000 14:16:04.023 NOTICE: Check Modem
08/12/2000 14:16:22.925 CMD: Bypass Mode Command
08/12/2000 14:16:23.443 STATUS: K5 (Backfeed) Closed
08/12/2000 14:16:23.586 STATUS: On Bypass
08/12/2000 14:16:24.860 NOTICE: Output Under Voltage OK
08/12/2000 14:17:20.900 NOTICE: Input Under Voltage OK
08/12/2000 14:17:23.606 ALARM: Rectifier Under Voltage OK
08/12/2000 14:17:25.557 ALARM: Battery Under Voltage OK
08/12/2000 14:19:01.899 CMD: PPU On Command
08/12/2000 14:19:04.089 STATUS: K1 (Input) Closed

Figure 12–18. Event History Log

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Remote Notification 13

13.1 Description

Remote Notification provides the user with the option of receiving alarms and notices at a remote location. Remote Notification operates through a standard computer modem. Using the Terminal mode, the user calls the UPS to perform basic monitoring. In the event of a UPS alarm or notice, the user is notified at the remote location. The UPS calls, through the modem, to the user's computer or pager and leaves a message.

Remote Notification is an extension of the Terminal mode with the additional support algorithms necessary to control an external modem (refer to Chapter 12, "Serial Communications"). Connection to the UPS is made when a user calls the UPS on the phone. The user has exactly the same capabilities as if using a terminal connected directly to the UPS RS−232 port. Remote Notification differs from the basic Terminal mode with the addition of Call Answer, Call Out, and Housekeeping functions. The Call Answer function allows the user to call into the UPS from a remote location and enter Terminal mode. The Call Out function allows the UPS to be configured to call either a remote computer or numeric paging service over the phone line. Call Out allows the UPS to call a remote computer and leave a one-line descriptive message of the alarm or notice condition. Numeric paging support allows the UPS to call a paging service and send numeric messages. The Housekeeping function maintains the link between the UPS and modem.

13.2 Remote Notification Features

Remote Notification provides the UPS with the capability to utilize a standard off-the-shelf PC modem as a telephone interface. The features provided by this option are as follows:

- Call out to a remote terminal or pager based on programmable events and alarms.
- Four separate, programmable notification groups (phone numbers).
- Automatic answering (user configurable) for access to the Terminal mode of the UPS.
- Remote and local ability to clear Call Out alarms and events.
- Error detection and correction for misconfigured and disconnected modems.
- Uses standard modems and null modem cables available at your local computer supply center.

13.3 Description of Operation

The Remote Notification option performs three basic functions: Call Answer into Terminal mode, Call Out to a remote terminal, and Housekeeping. Remote Notification also allows access to any functions available in the Terminal mode from a remote computer or terminal.

13.3.1 Call Answer

When the modem receives a call, the UPS is alerted to wait for a connect signal from the modem. When the modem answers and finishes handshaking, the UPS acknowledges the modem connect signal and allows the caller to use the Terminal mode (refer to Chapter 12, “Serial Communications”). In this mode, the user can request the following:

NOTE: *The brackets ([ ]) in the following steps indicate standard keyboard characters.*

- Display UPS Control Panel. Press and hold [ESC], then press [V].
- Display event History by pressing and holding [ESC], then pressing [H].
- Display Node Bits Setup by pressing and holding [ESC], then pressing [N].
- Display any new event by pressing and holding [ESC], then pressing [L].

13.3.2 Call Out

The Call Out function contains programmable alarms (setup by service personnel) and status events (refer to Chapter 11, “Responding to System Events”). The notification groups tell the UPS to notify a remote computer or pager for each selected event. Refer to the “Configuring the Modem” section of this chapter for information on the modem configuration. The Call Out function activates as follows:

- A UPS alarm or notice occurs that is programmed to cause a Call Out.
- The UPS takes the modem off the hook and sends a command to the modem to call the notification groups (phone numbers) required. The phone are stored in the modem only. The command sent to the modem for group one is “ATDS=0”, “ATDS=1” for group two, “ATDS=2” for group three, and “ATDS=3” for group four,. This allows the user to program the desired phone numbers into the modem.

- The UPS logs a successful notify to the event log when the remote computer or modem answers and leaves an event message with the following format.

nnn<space>mmm<LF><CR> where:

nnn	=	UPS_Remote_Notification–Default (40 characters maximum)
<space>	=	ASCII space character (0x20)
mmm	=	Event message for notice or alarm (40 characters maximum)
<LF>	=	ASCII line feed character (0x0A)
<CR>	=	ASCII carriage return character (0x0D)

If calling a pager service and the service answers, the modem can delay momentarily and before dialing the pager number. Refer to "Configuring the Modem to Call a Numeric Pager" section of this chapter for more information.

NOTE: *Because the pager service is not a modem, the UPS does not know if its message got through; therefore, the UPS continues to call the pager service for a programmed number of times or until a call-in reset is performed or the front panel is reset. An unsuccessful notify event is logged into the UPS event log for each attempted call out.*

If the phone number that the UPS is calling does not answer, the UPS delays for 5 minute through 60 minute time periods before reattempting the call. If answered, the UPS ceases further attempts to call. Each unsuccessful attempt to call causes an unsuccessful notify event to be logged into the UPS event log.

If all call groups are active, the UPS alternates between calling the groups. The Call Out process is terminated any time a successful connection is made by a remote terminal or by resetting the front panel of the UPS.

13.3.3 Housekeeping

When the modem is idle, the UPS "pings" (tests for connection) the modem by sending an "AT" to the modem at 15 minute intervals. If the modem does not respond correctly, by sending "0" (OK) to the UPS, the UPS attempts to re-initialize the modem. After a successful re-initialization, the UPS returns to the Housekeeping function. If the re-initialization is unsuccessful, three attempts to re-initialize the modem are made. Re-initialization is then attempted every 15 minutes or until the communications mode is changed by the UPS front panel controls (or the modem is successfully re-initialized). For each unsuccessful attempt, the UPS logs a check modem event into the event log. When the modem link is confirmed, the UPS communications resume normal operation.

13.4 Hardware Requirements

The following hardware components are required to connect the Remote Notification function.

- Modem: Basic external PC modem supporting the following AT commands.

  T – Tone dialing.
  &F – Load factory defaults.
  E0 – Do not echo characters in command state.
  N0 – Handshake only at speed specified by S37.
  Q0 – Return result codes in both originate and answer mode.
  V0 – Display result codes as numbers.
  X0 – Provide basic result codes: OK (0), CONNECT (1), RING (2), NO CARRIER (3), and ERROR (4).
  &D0 – Ignore status of DTR signal.
  &K0 – Disable local flow control.
  &Q5 – Communicate in error control mode.
  S0=1 – Auto Answering (1 ring).
  S37=6 – 2400 Baud.
  &W0 – Store setup in profile O.
  &Y0 – Recall profile O on power up.

NOTE: *Consult the modem manufacturer's manual to confirm that the above commands are supported by your modem.*

- Null modem serial cable with a male DB25 connector on the modem end and a DB9 connector on the UPS end.

All the above items can be acquired at your local computer products supply store.

An alternative to purchasing a cable is to build your own serial cable using the following pin out description :

DB25 to DB9 Null Modem Interface

Male DB25	Male DB9
pin 2	pin 2
pin 3	pin 3
pin 4	pin 8
pin 5	pin 7
pin 6	pin 1, 4
pin 7	pin 5
pin 8, 20	pin 6

13.5 Configuring the Modem

The modem must be programmed with the Call Out telephone numbers in order to operate the Remote Notification option.

To configure the modem, connect the serial port of a standard PC computer to the modem through the serial cable. Run a terminal emulation program on the computer. Test the connection to the modem by typing [A], [T] and [ENTER]. The modem should respond with either “OK” or “0” (zero). If the modem does not respond, consult the modem manufacturer’s manual to confirm your setup. If the modem still does not respond, then seek technical assistance from your modem manufacturer.

After connection, perform “Basic Modem Configuration” and the remaining sections of this chapter.

13.5.1 Basic Modem Configuration

The basic modem should be a plug and play type. All setup is done by the UPS. Only the initial phone number needs to be entered by the user.

13.5.2 Configuring the Modem to Call a Remote Computer

To configure the modem to call a remote computer, perform the following procedure:

NOTE: *The brackets ([ ]) in the following steps indicate characters that require keying in prior to pressing [ENTER].*

1. Connect the modem to the PC through the serial port as described in the modem manufacturer’s manual .
2. Key in [A], [T], then press [ENTER].
3. Confirm that the modem responds with “OK” or “0” (zero).

NOTE: *In steps 4 through 7, the “xxxxxxx” is the phone number of a remote computer. The phone number should include all local line and long distance access numbers needed to dial out. This number is limited to 32 characters. For example, use “9” if needed for an outside line, “1” for long distance + (Area Code) + Number or whatever access codes are needed to dial the call directly. Add a “,” in the number anywhere that a delay is needed. This will cause a two-second delay. More than one delay may be added to the number; for example, enter “AT&Z0=T,9,,1 (Area Code) (Phone Number)”.*

4. To program a group one number, key in [A], [T], [&], [Z], [0] (zero), [=], [xxxxxxx], then press [ENTER].
5. To program a group two number, key in [A], [T], [&], [Z], [1], [=], [xxxxxxx], then press [ENTER].
6. To program a group three number, key in [A], [T], [&], [Z], [2], [=], [xxxxxxx], then press [ENTER].

7. To program a group four number, key in [A], [T], [&], [Z], [3], [=], [xxxxxxx], then press [ENTER].

8. Confirm that the modem responds with “OK” or “0” (zero).

9. Connect a telephone line to the modem and test the modem by keying in [A], [T], [D], [S], = [0] (zero), then pressing [ENTER].

10. The modem dials the telephone number stored in step 4. (The number is displayed on the terminal screen as it is dialed.) Repeat steps 5 through 9 as necessary to verify the remaining group telephone numbers.

11. Confirm that the modem responds with “1” (one) or ”Connect” when the connection is made.

NOTE: *To set up group one through four pager numbers, refer to “Configuring the Modem to Call a Numeric Pager” section of this chapter.*

13.5.3 Configuring the Modem to Call a Numeric Pager

To configure the modem to call a numeric pager system, perform the following procedure.

NOTE: *The brackets ([ ]) in the following steps indicate characters that require keying in prior to pressing [ENTER].*

1. Connect the modem to the PC through the serial port as described in the modem manufacturer’s manual .

2. Key in [A], [T], then press [ENTER].

3. Confirm that the modem responds with “OK” or “0” (zero).

NOTE: *In steps 4 through 7 the “xxxxxxx” is the pager system number and “yyyyyyy” is the numeric message (usually a phone number). The three“[,]” provide a delay while the pager system computer answers. The “xxxxxxx” entry should include all local line and long distance access numbers needed to dial out, as well as the pause necessary between dialing the pager service and sending the pager the numeric message. This number is limited to 32 characters. For example, use “9” if needed for an outside line, “1” for long distance + (Area Code) + Number or whatever access codes are needed to dial the call directly. Add a “,” in the number anywhere that a delay is needed. This causes a two-second delay. More than one delay may be added to the number; for example, enter “AT&Z0=T,9,,1 (Area Code) (Phone Number) (Pauses) (Numeric Message)”. For areas with pulse dialing, the “T” should be inserted before the numeric message to switch to tone dialing. The numeric message can only be delivered using tone dialing. Keying in the “#” (pound) character at the end of the numeric message is very important. It prevents the pager service from picking up on the modem hang-up commands and sending additional characters.*

4. To program a group one number, key in [A], [T], [&], [Z], [0] (zero), [=], [xxxxxxx], [,], [,], [,], [yyyyyyy], [#], then press [ENTER].

5. To program a group two number, key in [A], [T], [&], [Z], [1], [=], [xxxxxxx], [,], [,], [,], [yyyyyyy], [#], then press [ENTER].

6. To program a group three number, key in [A], [T], [&], [Z], [2], [=], [xxxxxxx], [,], [,], [,], [yyyyyyy], [#], then press [ENTER].

7. To program a group four number, key in [A], [T], [&], [Z], [3], [=], [xxxxxxx], [,], [,], [,], [yyyyyyy], [#], then press [ENTER].

8. Confirm that the modem responds with “OK” or “0” (zero).

9. Connect a telephone line to the modem and test the modem by keying in [A], [T], [D], [S], [0] (zero), then pressing [ENTER].

10. The modem dials the telephone number stored in step 4 or step 5. (The number is displayed on the terminal screen as it is dialed.) Confirm that the pager receives the message. Repeat steps 5 through 9 as necessary to verify the remaining group telephone numbers and to modify the message.

NOTE: *To set up group one through four numbers to call a computer, refer to “Configuring the Modem to Call a Remote Computer” section of this chapter.*

To configure the modem to answer incoming calls, perform the following procedure.

13.6 UPS Setup Configuration

Connect the modem to the UPS by connecting one end of the serial cable to the UPS DB−9F connector on the back of the UPS and the other end to the modem (refer to Chapter 12, “Serial Communications”). If using a standard serial cable, a null modem adapter is required for the connection to the modem.

The Powerware 9330 UPS can only use the DB−9 serial Port for the Remote Notification option. This connection is located on the back of the UPS cabinet.

Remote modem communications are defaulted to 2400 baud.

Following the instructions in Chapter 8, “Using the Control Panel” and Chapter 12, “Serial Communications”, use the LCD screen and pushbuttons on the Control Panel to access the setup screen and configure the modem port as follows.

NOTE: *The modem should be connected to the UPS as described in the modem manufacturer’s manual before configuring the UPS communications port.*

<RATE>	The baud rate at which the modem will communicate to other modems, 2400 baud.
<DATA/STOP>	8 1 Standard 8 data bits, 1 stop bit, no parity.
<HANDSHAKING>	Disabled
<SAVE>	Yes. To save new configuration.

The handshaking feature listed is for UPS-to-terminal handshaking, not UPS-to-modem handshaking. If the remote terminal has buffering problems because of excessive data transfer rate from the UPS, XON/XOFF handshaking can be selected to resolve this issue. The user must make sure that the modem (not the remote terminal) at the remote terminal end of the connection is configured for either hardware handshaking or none at all. This is required so that the modem does not attempt to trap the XON/XOFF characters and prevent them from being transmitted to the UPS.

13.6.1 Default Events

The default messages sent are listed in the following table.

UPS Failure Events (Set for Phone Four)	
Message	Action
Bypass Control Failure	Notify Service
Calibrate DC AutoBalance	Notify Service
Charger Failure	Notify Service
Check Boost	Notify Service
Check Inverter	Notify Service
Check K1	Notify Service
Check K2	Notify Service
Check K3	Notify Service
Check K5	Notify Service
Check Neutral Regulator	Notify Service
DC Link Voltage Sensing Failure	Notify Service
Heat Sink Thermistor Failure	Notify Service
Input Failure	Notify Service
UPS Tripped	Notify Service

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Maintaining the UPS System 14

14.1 General

The components inside the UPS cabinet are secured to a sturdy metal frame. All repairable parts and assemblies are located for easy removal, with very little disassembly. This design allows authorized service personnel to perform routine maintenance and servicing quickly.

You must schedule periodic performance checks of your UPS system to keep it running properly. Regular routine checks of operation and system parameters will enable your system to function efficiently for many trouble-free years.

14.2 Important Safety Instructions

Remember that your UPS system is designed to supply power ***EVEN WHEN DISCONNECTED FROM THE UTILITY POWER***. The UPS module interiors are unsafe until the DC power source is disconnected and the electrolytic capacitors are discharged. After disconnecting the utility power and the DC power, authorized service personnel should wait at least 5 minutes for capacitor bleedoff before attempting internal access to the UPS module.

WARNING:
Servicing and maintenance should be performed by qualified service personnel only.

WARNING:
LETHAL VOLTAGE PRESENT. This unit should not be operated with the cabinet doors open or protective panels removed. Do not make any assumptions about the electrical state of any cabinet in the UPS system.

Since each battery string is an energy source in itself, opening the Battery Circuit Breaker does not de-energize the voltage within the battery string. **DO NOT ATTEMPT TO ACCESS ANY INTERNAL AREA OF THE BATTERY STRING YOURSELF. VOLTAGES ARE ALWAYS PRESENT IN THE BATTERY STRING.** If you suspect that a battery string needs service, you should contact your local field service office.

If the string requires service, refer to the battery manufacturer's operating manual for instructions on battery maintenance, or contact your local field service office.

Observe these precautions when working on or around batteries:

- Remove watches, rings, or other metal objects.
- Use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of batteries or battery cabinets.
- Disconnect the charging source prior to connecting or disconnecting terminals.
- Determine if the battery is inadvertently grounded. If it is, remove the source of the ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock will be reduced if such grounds are removed during installation and maintenance.
- When replacing batteries, use the same number of sealed, lead-acid batteries.
- Proper disposal of batteries is required. Refer to your local codes for disposal requirements.

WARNING:
HAZARDOUS WASTE. Do not incinerate or dispose of batteries indiscriminately. Observe local and national codes.

WARNING:
Do not dispose of battery or batteries in a fire. The battery may explode.

Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes, and may be toxic.

A battery can cause electrical shock, burn from high short-circuit current, or fire. Observe proper precautions.

ATTENTION:
Une batterie peut prêsenter un risque de choc êlectrique, de brulure, ou d'incendie. Suivre les précautions qui s'imposent.

- Pour le remplacement, utiliser le même nombre et modéle des batteries.
- L'élimination des batteries est règlementée. Consulter les codes locaux à cet effet.

14.3 Performing Preventive Maintenance

The UPS system requires very little preventive maintenance. However, the system should be inspected periodically to verify that the units are operating normally and that the batteries are in good condition.

Perform the following checks DAILY:

1. Check the area surrounding the UPS system. Ensure the area is not cluttered, allowing free access to the unit.
2. Ensure the air intakes (vents on the front) and exhaust opening (on rear of the UPS cabinet) are not blocked.
3. Ensure there is at least 12 inches of clearance behind the unit for proper air circulation.
4. Ensure the operating environment is within the parameters specified in Chapter 15, “Product Specifications.”
5. Ensure the UPS is in Normal mode (Normal status indicator is illuminated). If an alarm lamp is illuminated or the Normal status indicators are not illuminated, contact Customer Support.

Perform the following checks MONTHLY:

1. Monitor system parameters as described in Chapter 8, “Using the Control Panel.”
2. The UPS cooling air intake filter on the Powerware 9330 (10 kVA–20kVA) is located behind the removable front panel. The UPS cooling air intake filters on the Powerware 9330 (25 kVA–40kVA) are located behind both removable front panels. Check the air filters and replace as necessary. The filter size is 12 in. x 12 in. x 1 in. To remove filter:
   a. Remove front panel.
   b. Press up on retaining clip at top of filter and remove filter.
   c. Install new filter.
   d. Reinstall front panel.
3. Record the results of your checks and any corrective actions in a suitable log.

ANNUAL maintenance:

Annual preventive maintenance should be performed only by authorized service personnel familiar with maintenance and servicing of the UPS system. Contact your nearest field service office for more information about service offerings.

BATTERY maintenance:

Contact your nearest field service office for battery maintenance. Battery replacement and maintenance should be performed only by authorized service personnel.

14.4 Maintenance Training

A basic training course, available from Powerware Inc., gives you a competent working knowledge of the UPS system operation and teaches you how to perform first level corrective maintenance. For more information about training and other services, contact the Powerware Corporation Training Coordinator in Raleigh, North Carolina, or call Powerware corporation field service at **1–800–843–9433**.

Product Specifications 15

15.1 Model Numbers

The UPS systems are housed in freestanding, cabinets with safety shields behind the front panels. The UPS systems are available in 50/60 Hz with various output power ratings. Smaller models within a system may be upgraded in the field to larger models:

System	Models	Nominal Frequency
Powerware 9330	10, 15, 20 kVA	50/60 Hz
Powerware 9330	25, 30, 35, 40 kVA	50/60 Hz

The following sections detail the input, output, environmental, and battery specifications for the UPS.

15.2 UPS System Input

Operating Input Voltage (Nominal +10/–15%)	600 VAC for operation from 510 VAC to 660 VAC (50/60 Hz) 480 VAC for operation from 408 VAC to 528 VAC (50/60 Hz) 208 VAC for operation from 177 VAC to 229 VAC (50/60 Hz)
Operating Input Frequency Range	±3 Hz of nominal (50 Hz or 60 Hz)
Operating Input Current	Refer to Appendix A, Tables A through F, for 10, 15, and 20 kVA Models and Tables G through M, for 25, 30, 35, and 40 kVA Models. *Reduced for Generator:* Adjustable
Battery Charge Current	*Battery Charge:* Up to 7 Amperes for 10, 15, and 20 kVA models Up to 14 Amperes for 25, 30, 35, and 40 kVA models
Input Current Harmonic Content	10% THD at full load (with input filter option installed) 30% THD at full load (without input filter option installed)
Power Factor	Minimum 0.96
Line Surges	6 kV OC, 3 kA SC per ANSI 62.41 and IEC 801–4
Battery Voltage	288 VDC nominal (144 cells @2V/cell)

15.3 UPS System Output

DC Filtering	Ripple voltage less than 0.5% peak to peak
UPS Output Capacity	100% rated current at 0.7 power factor
Output Voltage Regulation	1% (10% to 100% load)
Output Voltage Adjustment (Nominal +/--5%)	480 VAC nominal, adjustable from 456 VAC to 504 VAC (50/60 Hz) 208 VAC nominal, adjustable from 198 VAC to 218 VAC (50/60 Hz)
Output Current	Refer to Appendix A, Tables A through F, for 10, 15, and 20 kVA Models and Tables G through M, for 25, 30, 35, and 40 kVA Models.
Output Voltage Harmonic Content	3% max THD, 2% max single (linear load)
Output Voltage Balance	3% for 100% maximum load imbalance (linear load)
Output Voltage Phase Displacement	3˚ for 100% maximum load imbalance (linear load)
Output Transients	±5% for 100% load step or removal
Frequency Regulation	±0.01 Hz free running
Synchronous to Bypass	Bypass within voltage limits of +10%, −15% of output setting; bypass within ±0.5 Hz
Frequency Slew Rate	1 Hz per second maximum (adjustable)
Overload Capability	101−110% for 10 minutes 111−125% for 1 minute
Maximum Output Capability	300% peak for 10 cycles without bypass

15.4 Environmental Specifications

Operating Temperature	0 to 40˚C without derating. The recommended operating temperature is 25˚C.
Operating Altitude	Maximum 1500m (5000 ft) at 40°C without derating
Storage Temperature	−20 to +70˚C (prolonged storage above 40˚C will cause rapid battery self-discharge)
Relative Humidity (operating and storage)	95% maximum, noncondensing
Acoustical Noise	60 dBA at a 1m distance
EMI Suppression	Meets FCC Regulation 47, Part 15, for class A devices
Electrostatic Discharge (ESD) Immunity	Meets IEC 801−2 specifications. Withstands up to 25 kV pulse without damage and with no disturbance or adverse effect to the critical load.
System Efficiency at Full Unity Power Factor Load and Nominal Input Voltage	*208V Models*: 92% in Normal Mode 98% in High Efficiency Mode *480V Models*: 90% in Normal Mode 96% in High Efficiency Mode *600V Models*: 90% in Normal Mode 96% in High Efficiency Mode

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Appendix A – Customer Information

The information in this appendix will help you plan for and install your UPS system. This appendix contains the following drawings:

- 164201300–1 Power Wiring Installation Notes
- 164201300–2 Customer Interface Wiring Installation Notes
- 164201300–3 Physical Features and Requirements
- 164201300–4 Typical UPS System
- 164201300–5 UPS System Configurations
- 164201300–6 Oneline Drawing of UPS Cabinet
- 164201300–7 Options Cabinet Schematics
- 164201300–8 Location of UPS Cabinet Terminals Powerware 9330 (10 kVA–20 kVA)
- 164201300–9 Location of UPS Cabinet Terminals Powerware 9330 (25 kVA–40 kVA)
- 164201300–10 Location of Options Cabinet Terminals Powerware 9330 (10 kVA–20 kVA)
- 164201300–11 Location of Options Cabinet Terminals Powerware 9330 (25 kVA–40 kVA)
- 164201300–12 Location of Battery Cabinet Terminals Powerware 9330 (10 kVA–20 kVA) Powerware 9330 (25 kVA–40 kVA)
- 164201300–13 UPS Cabinet Dimensions Powerware 9330 (10 kVA–20 kVA)
- 164201300–14 UPS Cabinet Dimensions Powerware 9330 (25 kVA–40 kVA)
- 164201300–15 Options Cabinet Dimensions Powerware 9330 (10 kVA–20 kVA)
- 164201300–16 Options Cabinet Dimensions Powerware 9330 (25 kVA–40 kVA)
- 164201300–17 Battery Cabinet Dimensions Powerware 9330 (10 kVA–20 kVA) Powerware 9330 (25 kVA–40 kVA)
- 164201300–18 Remote Emergency Power Off Dimensions
- 164201300–19 Remote Monitor Panel Dimensions

Table A. INPUT/OUTPUT Ratings & External Wiring Requirements for
Powerware 9330–20/10
(Without Options Cabinet)

Ratings		*Units*	*Rating 50/60 Hz*
Basic unit ratings at 0.7 lagging PF load		KVA KW	10 7
		INPUT/OUTPUT VOLTAGE	208
AC INPUT	**AC Input to UPS Rectifier (0.95min.PF)** *3Ø, 1 gnd*	Amps*	28
	Minimum conductor size (number per Ø) Ⓐ	AWG or kcmil(ea)	8 (1)
	*(Maximum amps includes full load current plus battery recharge current)		
AC INPUT	**AC Input to Module Bypass (UPS Bypass)** *Full Load Current 3Ø, (1) Neutral, (1) gnd* Ⓑ	Amps	27.8
	Minimum conductor size (number per Ø)	AWG or kcmil(ea)	8 (1)
DC INPUT	**DC Input from External Battery Source to UPS** Ⓒ *(1) positive, (1) negative, (1) gnd*	VDC (Nominal) Amps	288 26
	Minimum conductor size (number per pole) (See note 8)	AWG or kcmil(ea)	10 (1)
AC OUTPUT	**AC Output to Critical Load** Ⓓ *Full Load Current 3Ø, (1) Neutral, (1) gnd*	Amps	27.8
	Minimum conductor size (number per Ø)	AWG or kcmil(ea)	8 (1)

Read and understand the following notes while planning your installation:

1. Refer to national and local electrical codes for acceptable external wiring practices.
2. The bypass feed into this equipment utilizes four wires. The rectifier feed into this equipment utilizes three wires. However, the phases must be symmetrical about ground (i.e., from a Wye source) for proper equipment operation. Failure to follow these instructions will void the product warranty.
3. Material and labor for external wiring requirements are to be provided by designated personnel.
4. For external wiring, use 90°C copper wire. See the appropriate column in Tables A through M.
5. Wire ampacities are chosen from Table 310–16 of the NEC.
6. A bypass neutral feeder must be supplied.
7. Refer to Section I of this manual for installation Instructions.
8. UPS systems not using an external battery source are supplied with internal batteries prewired to the UPS at the factory. External Line-up and Match Battery cabinets are provided with with quick disconnect cables for connection to the UPS. No external wiring is required for Line-up and Match batery cabinets. All products can be connected to an external battery source through the DC connections terminal block. An external DC ground is established through the grounding terminal in the bottom of the cabinet.

NOTE: Callout letter Ⓐ, Ⓑ, Ⓒ, and Ⓓ map to drawing #164201300–6

DESCRIPTION:	**POWER WIRING INSTALLATION NOTES**		
DRAWING NO:	164201300–1	*SHEET:*	1 of 17
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Table B. INPUT/OUTPUT Ratings & External Wiring Requirements for

Powerware 9330–20/15

(Without Options Cabinet)

Ratings			*Units*	*Rating 50/60 Hz*
Basic unit ratings at 0.7 lagging PF load			KVA KW	15 10.5
			INPUT/OUTPUT VOLTAGE	208
AC INPUT	**AC Input to UPS Rectifier (0.95min.PF)** *3Ø, 1 gnd*		Amps*	40
	Minimum conductor size (number per Ø)	A	AWG or kcmil(ea)	8 (1)
	*(Maximum amps includes full load current plus battery recharge current)			
AC INPUT	**AC Input to Module Bypass (UPS Bypass)** *Full Load Current 3Ø, (1) Neutral, (1) gnd*	B	Amps	41.6
	Minimum conductor size (number per Ø)		AWG or kcmil(ea)	6 (1)
DC INPUT	**DC Input from External Battery Source to UPS** *(1) positive, (1) negative, (1) gnd*	C	VDC (Nominal) Amps	288 39
	Minimum conductor size (number per pole) (See note 8)		AWG or kcmil(ea)	8 (1)
AC OUTPUT	**AC Output to Critical Load** *Full Load Current 3Ø, (1) Neutral, (1) gnd*	D	Amps	41.6
	Minimum conductor size (number per Ø)		AWG or kcmil(ea)	6 (1)

Table C. INPUT/OUTPUT Ratings & External Wiring Requirements for

Powerware 9330–20/20

(Without Options Cabinet)

Ratings			*Units*	*Rating 50/60 Hz*
Basic unit ratings at 0.7 lagging PF load			KVA KW	20 14
			INPUT/OUTPUT VOLTAGE	208
AC INPUT	**AC Input to UPS Rectifier (0.95min.PF)** *3Ø, 1 gnd*		Amps*	52
	Minimum conductor size (number per Ø)	A	AWG or kcmil(ea)	6 (1)
	*(Maximum amps includes full load current plus battery recharge current)			
AC INPUT	**AC Input to Module Bypass (UPS Bypass)** *Full Load Current 3Ø, (1) Neutral, (1) gnd*	B	Amps	55.5
	Minimum conductor size (number per Ø)		AWG or kcmil(ea)	4 (1)
DC INPUT	**DC Input from External Battery Source to UPS** *(1) positive, (1) negative, (1) gnd*	C	VDC (Nominal) Amps	288 52
	Minimum conductor size (number per pole) (See note 8)		AWG or kcmil(ea)	6 (1)
AC OUTPUT	**AC Output to Critical Load** *Full Load Current 3Ø, (1) Neutral, (1) gnd*	D	Amps	55.5
	Minimum conductor size (number per Ø)		AWG or kcmil(ea)	4 (1)

NOTE: Callout letter Ⓐ, Ⓑ, Ⓒ, and Ⓓ map to drawing #164201300–6

DESCRIPTION:	**POWER WIRING INSTALLATION NOTES**		
DRAWING NO:	164201300–1	*SHEET:*	2 of 17
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Table D. Ratings & External Wiring Requirements for

Powerware 9330 (10 kVA–20 kVA)

Options Cabinet INPUT and BYPASS Transformers

		Ratings 50/60 Hz					
Basic unit ratings at 0.7 lagging PF load		Series/ Model	kVA/KW	Voltage		Input Current (Amps)	Conductor
				Input	Output		Minimum Size
AC INPUT	**AC Input to UPS Rectifier Transformer (0.95min.PF)** *3Ø, 1 gnd* Ⓐ	20/10	10/7	208	208	27.8	8
		20/10	10/7	480	208	12	14
		20/10	10/7	600	208	9.6	14
		20/15	15/10.5	208	208	41.6	6
		20/15	15/10.5	480	208	18	12
		20/15	15/10.5	600	208	14.4	12
		20/20	20/14	208	208	55.5	4
		20/20	20/14	480	208	24	10
		20/20	20/14	600	208	19.2	12
AC INPUT	**AC Input to UPS Bypass Transformer** *Full Load Current* *3Ø, 1 Neutral, 1 gnd* Ⓑ	20/10	10/7	208	208	27.8	8
		20/10	10/7	480	208	12	14
		20/10	10/7	600	208	9.6	14
		20/15	15/10.5	208	208	41.6	6
		20/15	15/10.5	480	208	18	12
		20/15	15/10.5	600	208	14.4	12
		20/20	20/14	208	208	55.5	4
		20/20	20/14	480	208	24	10
		20/20	20/14	600	208	19.2	12

NOTE: Callout letter Ⓐ, Ⓑ, Ⓒ, and Ⓓ map to drawing #164201300–6

DESCRIPTION:	**POWER WIRING INSTALLATION NOTES**		
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Table E. Ratings & External Wiring Requirements for

Powerware 9330 (10 kVA–20 kVA)

Options Cabinet OUTPUT Transformer

		Ratings 50/60 Hz					
Basic unit ratings at 0.7 lagging PF load		Series/ Model	kVA/KW	Voltage		Output Current (Amps)	Conductor
				Input	Output		Minimum Size
AC OUTPUT	**AC Output from Output Transformer to Critical Load (0.95min.PF)** *3Ø, 1 Neutral, 1 gnd* Ⓓ	20/10	9.5/6.65	208	208	26.4	10
		20/10	9.5/6.65	208	480	11.4	14
		20/15	14.25/10	208	208	39.6	8
		20/15	14.25/10	208	480	17	12
		20/20	19/13.3	208	208	52.7	6
		20/20	19/13.3	208	480	22.8	10

Table F. Ratings & External Wiring Requirements for

Powerware 9330 (10 kVA–20 kVA)

Options Cabinet OUTPUT Without Output Transformer

		Ratings 50/60 Hz					
Basic unit ratings at 0.7 lagging PF load		Series/ Model	kVA/KW	Voltage		Output Current (Amps)	Conductor
				Input	Output		Minimum Size
AC OUTPUT	**AC Output from Output to Critical Load (0.95min.PF)** *3Ø, 1 Neutral, 1 gnd* Ⓓ	20/10	10/7	208	208	27.8	8
		20/15	15/10.5	208	208	41.6	6
		20/20	20/14	208	208	55.5	4

NOTE: Callout letter Ⓐ, Ⓑ, Ⓒ, and Ⓓ map to drawing #164201300–6

DESCRIPTION:	**POWER WIRING INSTALLATION NOTES**		
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Table G. INPUT/OUTPUT Ratings & External Wiring Requirements for
Powerware 9330–40/25
(Without Options Cabinet)

Ratings			*Units*	*Rating 50/60 Hz*
Basic unit ratings at 0.7 lagging PF load			KVA KW	25 17.5
			INPUT/OUTPUT VOLTAGE	208
AC INPUT	**AC Input to UPS Rectifier (0.95min.PF)** *3Ø, 1 gnd* *Minimum conductor size (number per Ø)* *(Maximum amps includes full load current plus battery recharge current)	Ⓐ	Amps* AWG or kcmil(ea)	70 3 (1)
AC INPUT	**AC Input to Module Bypass (UPS Bypass)** *Full Load Current 3Ø, (1) Neutral, (1) gnd* *Minimum conductor size (number per Ø)*	Ⓑ	Amps AWG or kcmil(ea)	69.4 4 (1)
DC INPUT	**DC Input from External Battery Source to UPS** *(1) positive, (1) negative, (1) gnd* *Minimum conductor size (number per pole) (See note 8)*	Ⓒ	VDC (Nominal) Amps AWG or kcmil(ea)	288 64 4 (1)
AC OUTPUT	**AC Output to Critical Load** *Full Load Current 3Ø, (1) Neutral, (1) gnd* *Minimum conductor size (number per Ø)*	Ⓓ	Amps AWG or kcmil(ea)	69.4 4 (1)

Table H. INPUT/OUTPUT Ratings & External Wiring Requirements for
Powerware 9330–40/30
(Without Options Cabinet)

Ratings			*Units*	*Rating 50/60 Hz*
Basic unit ratings at 0.7 lagging PF load			KVA KW	30 21
			INPUT/OUTPUT VOLTAGE	208
AC INPUT	**AC Input to UPS Rectifier (0.95min.PF)** *3Ø, 1 gnd* *Minimum conductor size (number per Ø)* *(Maximum amps includes full load current plus battery recharge current)	Ⓐ	Amps* AWG or kcmil(ea)	80 3 (1)
AC INPUT	**AC Input to Module Bypass (UPS Bypass)** *Full Load Current 3Ø, (1) Neutral, (1) gnd* *Minimum conductor size (number per Ø)*	Ⓑ	Amps AWG or kcmil(ea)	83 2 (1)
DC INPUT	**DC Input from External Battery Source to UPS** *(1) positive, (1) negative, (1) gnd* *Minimum conductor size (number per pole) (See note 8)*	Ⓒ	VDC (Nominal) Amps AWG or kcmil(ea)	288 78 3 (1)
AC OUTPUT	**AC Output to Critical Load** *Full Load Current 3Ø, (1) Neutral, (1) gnd* *Minimum conductor size (number per Ø)*	Ⓓ	Amps AWG or kcmil(ea)	83 2 (1)

NOTE: Callout letter Ⓐ, Ⓑ, Ⓒ, and Ⓓ map to drawing #164201300–6

DESCRIPTION:	**POWER WIRING INSTALLATION NOTES**		
DRAWING NO:	164201300–1	*SHEET:*	5 of 17
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Table I. INPUT/OUTPUT Ratings & External Wiring Requirements for

Powerware 9330–40/35

(Without Options Cabinet)

	Ratings		*Units*	*Rating 50/60 Hz*
Basic unit ratings at 0.7 lagging PF load			KVA KW	35 24.5
			INPUT/OUTPUT VOLTAGE	208
AC INPUT	**AC Input to UPS Rectifier (0.95min.PF)** *3Ø, 1 gnd*		Amps*	92
	Minimum conductor size (number per Ø)	Ⓐ	AWG or kcmil(ea)	2 (1)
	*(Maximum amps includes full load current plus battery recharge current)			
AC INPUT	**AC Input to Module Bypass (UPS Bypass)** *Full Load Current 3Ø, (1) Neutral, (1) gnd*	Ⓑ	Amps	97
	Minimum conductor size (number per Ø)		AWG or kcmil(ea)	1 (1)
DC INPUT	**DC Input from External Battery Source to UPS** *(1) positive, (1) negative, (1) gnd*	Ⓒ	VDC (Nominal) Amps	288 91
	Minimum conductor size (number per pole) (See note 8)		AWG or kcmil(ea)	2 (1)
AC OUTPUT	**AC Output to Critical Load** *Full Load Current 3Ø, (1) Neutral, (1) gnd*	Ⓓ	Amps	97
	Minimum conductor size (number per Ø)		AWG or kcmil(ea)	1 (1)

Table J. INPUT/OUTPUT Ratings & External Wiring Requirements for

Powerware 9330–40/40

(Without Options Cabinet)

	Ratings		*Units*	*Rating 50/60 Hz*
Basic unit ratings at 0.7 lagging PF load			KVA KW	40 28
			INPUT/OUTPUT VOLTAGE	208
AC INPUT	**AC Input to UPS Rectifier (0.95min.PF)** *3Ø, 1 gnd*		Amps*	100
	Minimum conductor size (number per Ø)	Ⓐ	AWG or kcmil(ea)	1 (1)
	*(Maximum amps includes full load current plus battery recharge current)			
AC INPUT	**AC Input to Module Bypass (UPS Bypass)** *Full Load Current 3Ø, (1) Neutral, (1) gnd*	Ⓑ	Amps	111
	Minimum conductor size (number per Ø)		AWG or kcmil(ea)	2/0 (1)
DC INPUT	**DC Input from External Battery Source to UPS** *(1) positive, (1) negative, (1) gnd*	Ⓒ	VDC (Nominal) Amps	288 100
	Minimum conductor size (number per pole) (See note 8)		AWG or kcmil(ea)	1 (1)
AC OUTPUT	**AC Output to Critical Load** *Full Load Current 3Ø, (1) Neutral, (1) gnd*	Ⓓ	Amps	111
	Minimum conductor size (number per Ø)		AWG or kcmil(ea)	2/0 (1)

NOTE: Callout letter Ⓐ, Ⓑ, Ⓒ, and Ⓓ map to drawing #164201300–6

DESCRIPTION:	**POWER WIRING INSTALLATION NOTES**	
DRAWING NO:	164201300–1	*SHEET:* 6 of 17
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Table K. Ratings & External Wiring Requirements for

Powerware 9330 (25 kVA–40 kVA)

Options Cabinet INPUT and BYPASS Transformers

		Ratings 50/60 Hz					
Basic unit ratings at 0.7 lagging PF load		Series/ Model	kVA/KW	Voltage		Input Current (Amps)	Conductor Minimum Size
				Input	Output		
AC INPUT	**AC Input to UPS Rectifier Transformer (0.95min.PF)** *3Ø, 1 gnd* Ⓐ	40/25	25/17.5	208	208	69.4	4
		40/25	25/17.5	480	208	30	8
		40/25	25/17.5	600	208	24	10
		40/30	30/21	208	208	83	2
		40/30	30/21	480	208	36	8
		40/30	30/21	600	208	28.8	10
		40/35	35/24.5	208	208	97	1
		40/35	35/24.5	480	208	42	6
		40/35	35/24.5	600	208	33.6	8
		40/40	40/28	208	208	111	1/0
		40/40	40/28	480	208	48	6
		40/40	40/28	600	208	38.5	8
AC INPUT	**AC Input to UPS Bypass Transformer** *Full Load Current* *3Ø, 1 Neutral, 1 gnd* Ⓑ	40/25	25/17.5	208	208	69.4	4
		40/25	25/17.5	480	208	30	8
		40/25	25/17.5	600	208	24	10
		40/30	30/21	208	208	83	2
		40/30	30/21	480	208	36	8
		40/30	30/21	600	208	28.8	10
		40/35	35/24.5	208	208	97	1
		40/35	35/24.5	480	208	42	6
		40/35	35/24.5	600	208	33.6	8
		40/40	40/28	208	208	111	1/0
		40/40	40/28	480	208	48	6
		40/40	40/28	600	208	33.5	8

NOTE: Callout letter Ⓐ, Ⓑ, Ⓒ, and Ⓓ map to drawing #164201300–6

DESCRIPTION:	**POWER WIRING INSTALLATION NOTES**		
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Table L. Ratings & External Wiring Requirements for

Powerware 9330 (25 kVA–40 kVA)

Options Cabinet OUTPUT Transformer

		Ratings 50/60 Hz					
Basic unit ratings at 0.7 lagging PF load		Series/ Model	kVA/KW	Voltage		Output Current (Amps)	Conductor
				Input	Output		Minimum Size
AC OUTPUT	**AC Output from Output Transformer to Critical Load (0.95min.PF)** *3Ø, 1 Neutral, 1 gnd* Ⓓ	40/25	23.8/16.6	208	208	66	4
		40/25	23.8/16.6	208	480	28.6	10
		40/30	28.5/20	208	208	79	3
		40/30	28.5/20	208	480	34.3	8
		40/35	33.2/23.3	208	208	92.4	2
		40/35	33.2/23.3	208	480	40	8
		40/40	38/26.6	208	208	105.5	1
		40/40	38/26.6	208	480	45.7	6

Table M. Ratings & External Wiring Requirements for

Powerware 9330 (25 kVA–40 kVA)

Options Cabinet OUTPUT Without Output Transformer

		Ratings 50/60 Hz					
Basic unit ratings at 0.7 lagging PF load		Series/ Model	kVA/KW	Voltage		Output Current (Amps)	Conductor
				Input	Output		Minimum Size
AC OUTPUT	**AC Output from Output to Critical Load (0.95min.PF)** *3Ø, 1 Neutral, 1 gnd* Ⓓ	40/25	25/17.5	208	208	69.4	4
		40/30	30/21	208	208	83	2
		40/35	35/24.5	208	208	97	1
		40/40	40/28	208	208	111	1/0

NOTE: Callout letter Ⓐ, Ⓑ, Ⓒ, and Ⓓ map to drawing #164201300–6

DESCRIPTION:	**POWER WIRING INSTALLATION NOTES**	
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9. Terminals are UL and CSA rated at 90˚C. Refer to Tables N through Q for power cable terminations, and Table R and U for conduit requirements. Drawings 164201300−8 through 164201300−12 show the location of the power cable terminals inside the UPS, Options, and Battery Cabinets.

Table N. UPS Cabinet Power Cable Terminations Powerware 9330 (10 kVA−20 kVA)

Terminal Function	*Terminal*	*Function*	*Size of Pressure Termination*	Vendor	*Tightening Torque N-M (lb-in.)*	*Type Screw*
AC Input to UPS Rectifier and Bypass (TB2) (Single Input)	A	Phase A	1 − #14−#4	Entrelec	1.3-1.4 (11-12)	Slotted
				Phoenix	1.5-1.8 (13-16)	
	B	Phase B	1 − #14−#4	Entrelec	1.3-1.4 (11-12)	Slotted
				Phoenix	1.5-1.8 (13-16)	
	C	Phase C	1 − #14−#4	Entrelec	1.3-1.4 (11-12)	Slotted
				Phoenix	1.5-1.8 (13-16)	
	N	Neutral	1 − #4−#0	Entrelec	2.5-2.9(22-26)	Slotted
				Phoenix	3.2-3.7(28-33)	
AC Input to UPS Rectifier (CB1) (Dual Input)	A	Phase A	1 − #18−#2	N/A	2.0 (17.5)	Phillips
	B	Phase B	1 − #18−#2	N/A	2.0 (17.5)	Phillips
	C	Phase C	1 − #18−#2	N/A	2.0 (17.5)	Phillips
AC Input To Bypass (TB2) (Dual Input)	A	Phase A	1 − #14−#4	Entrelec	1.3-1.4 (11-12)	Slotted
				Phoenix	1.5-1.8 (13-16)	
	B	Phase B	1 − #14−#4	Entrelec	1.3-1.4 (11-12)	Slotted
				Phoenix	1.5-1.8 (13-16)	
	C	Phase C	1 − #14−#4	Entrelec	1.3-1.4 (11-12)	Slotted
				Phoenix	1.5-1.8 (13-16)	
	N	Neutral	1 − #4−#0	Entrelec	2.5-2.9(22-26)	Slotted
				Phoenix	3.2-3.7(28-33)	
AC Output to Critical Load (Part of TB3)	A	Phase A	1 − #14−#4	Entrelec	1.3-1.4 (11-12)	Slotted
				Phoenix	1.5-1.8 (13-16)	
	B	Phase B	1 − #14−#4	Entrelec	1.3-1.4 (11-12)	Slotted
				Phoenix	1.5-1.8 (13-16)	
	C	Phase C	1 − #14−#4	Entrelec	1.3-1.4 (11-12)	Slotted
				Phoenix	1.5-1.8 (13-16)	
	N	Neutral	1 − #4−#0	Entrelec	2.5-2.9(22-26)	Slotted
				Phoenix	3.2-3.7(28-33)	
DC Input from Battery to UPS	N/A	Battery (+)	Red Battery Connector	N/A	N/A	N/A
	N/A	Battery (−)	Black Battery Connector	N/A	N/A	N/A
External Battery Input to UPS (Part of TB3)	Battery +	Positive	1 − #14−#0	Entrelec	2.5-2.9(22-26)	Slotted
				Phoenix	3.2-3.7(28-33)	
	Battery −	Negative	1 − #14−#0	Entrelec	2.5-2.9(22-26)	Slotted
				Phoenix	3.2-3.7(28-33)	
Customer Ground	Ground	Ground	2 − #14−#1/0	N/A	5.6 (50)	Slotted

NOTE: Customer ground, size 1/0, can be run in any conduit listed in Table R.

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Table O. UPS Cabinet Power Cable Terminations Powerware 9330 (25 kVA–40 kVA)

Terminal Function	*Terminal*	*Function*	*Size of Pressure Termination*	Vendor	*Tightening Torque N-M (lb-in.)*	*Type Screw*
AC Input to UPS Rectifier and Bypass (TB2) (Single Input)	A	Phase A	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
				Phoenix	3.2-3.7(28-33)	
	B	Phase B	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
				Phoenix	3.2-3.7(28-33)	
	C	Phase C	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
				Phoenix	3.2-3.7(28-33)	
	N	Neutral	1 – #4–#4/0	Entrelec	4-6(35-52)	6 mm Allen
				Phoenix	15-20(133-177)	
AC Input to UPS Rectifier (CB1) (Dual Input)	A	Phase A	1 – #2–#4/0	ABB	13.5(120)	3/16 in. Allen
	B	Phase B	1 – #2–#4/0	ABB	13.5(120)	
	C	Phase C	1 – #2–#4/0	ABB	13.5(120)	
AC Input To Bypass (TB2) (Dual Input)	A	Phase A	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
				Phoenix	3.2-3.7(28-33)	
	B	Phase B	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
				Phoenix	3.2-3.7(28-33)	
	C	Phase C	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
				Phoenix	3.2-3.7(28-33)	
	N	Neutral	1 – #4–#4/0	Entrelec	4-6(35-52)	6 mm Allen
				Phoenix	15-20(133-177)	
AC Output to Critical Load (Part of TB3)	A	Phase A	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
				Phoenix	3.2-3.7(28-33)	
	B	Phase B	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
				Phoenix	3.2-3.7(28-33)	
	C	Phase C	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
				Phoenix	3.2-3.7(28-33)	
	N	Neutral	1 – #4–#4/0	Entrelec	4-6(35-52)	6 mm Allen
				Phoenix	15-20(133-177)	
DC Input from Battery to UPS	N/A	Battery (+)	Red Battery Connector	N/A	N/A	N/A
	N/A	Battery (–)	Black Battery Connector	N/A	N/A	N/A
External Battery Input to UPS (Part of TB3)	Battery +	Positive	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
				Phoenix	3.2-3.7(28-33)	
	Battery –	Negative	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
				Phoenix	3.2-3.7(28-33)	
Customer Ground	Ground	Ground	2 – #14–1/0	N/A	5.6 (50)	Slotted

NOTE: Customer ground, size 1/0, can be run in any conduit listed in Table R.

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Table P. Options Cabinet Power Cable Terminations Powerware 9330 (10 kVA–20 kVA)						
Terminal Function	*Terminal*	*Function*	*Size of Pressure Termination*	Vendor	*Tightening Torque N-M (lb-in.)*	*Type Screw*
AC Input to UPS Rectifier Transformer (TB1)	L1	Phase A	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
	L2	Phase B	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
	L3	Phase C	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
AC Input To UPS Bypass Transformer (TB1)	L1	Phase A	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
	L2	Phase B	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
	Ll3	Phase C	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
	N	Neutral	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
AC Output from Output Transformer to Critical Load (TB1)	X1	Phase A	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
	X2	Phase B	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
	X3	Phase C	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
	N	Neutral	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
Customer Ground	Ground	Ground	2 – #14–#1/0	N/A	5.6 (50)	Slotted

Table Q. Options Cabinet Power Cable Terminations Powerware 9330 (25 kVA–40 kVA)						
Terminal Function	*Terminal*	*Function*	*Size of Pressure Termination*	Vendor	*Tightening Torque N-M (lb-in.)*	*Type Screw*
AC Input to UPS Rectifier Transformer (TB1)	L1	Phase A	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
	L2	Phase B	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
	L3	Phase C	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
AC Input To UPS Bypass Transformer (TB1)	L1	Phase A	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
	L2	Phase B	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
	Ll3	Phase C	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
	N	Neutral	1 – #4–#4/0	Entrelec	3.2-3.7(28-33)	6 mm Allen
AC Output from Output Transformer to Critical Load (TB1)	X1	Phase A	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
	X2	Phase B	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
	X3	Phase C	1 – #14–#0	Entrelec	2.5-2.9(22-26)	Slotted
	N	Neutral	1 – #4–#4/0	Entrelec	4-6(35-52)	6 mm Allen
Customer Ground	Ground	Ground	2 – #14–1/0	N/A	5.6 (50)	Slotted

NOTE: Customer ground, size 1/0, can be run in any conduit listed in Table R.

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10. Per NEC article 300-20(a), all three phase conductors must be run in the same conduit. Neutral and ground must be run in the same conduit as the phase conductors.

11. Conduit is sized to accommodate one neutral conductor the same size as the phase conductor and one #8 AWG ground conductor. If two neutral conductors or an oversized neutral conductor are to be installed, check the size of the conduit needed to accommodate the extra wire or size and use that conduit size in place of the conduit size listed in table R. All 9330 products can accommodate a double size neutral.

12. Conduit sizes were chosen from NEC Table C1, type letters RHH, RHW, RHW-2, TW, THW, THHW, THW-2.

Table R. Power Cable Conduit Requirements Powerware 9330 (10 kVA–15 kVA)

Powerware System	*Voltage*	*Terminal*	*Number of Wires in Conduit*	*Minimum Conduit Trade Size (inches)*	*Number of Conduits*
9330-20/10	208 AC	AC Input to UPS (A, B, C, Gnd)	4	1/2	1
		AC Input to Bypass (A, B, C, Neut, Gnd)	5	3/4	1
		Output (A, B, C, Neut, Gnd)	5	3/4	1
9330–20/10	480/600 AC	AC Input to UPS (A, B, C, Gnd)	4	1/2	1
		AC Input to Bypass (A, B, C, Neut, Gnd)	5	1/2	1
		Output (A, B, C, Neut, Gnd)	5	1/2	1
9330–20/10	288 DC	External Battery DC Source (Positive, Negative, Gnd)	3	1/2	1
9330–20/15	208/480 /600 AC	AC Input to UPS (A, B, C, Gnd)	4	1/2	1
		AC Input to Bypass (A, B, C, Neut, Gnd)	5	3/4	1
		Output (A, B, C, Neut, Gnd)	5	3/4	1
9330–20/15	288 DC	External Battery DC Source (Positive, Negative, Gnd)	3	1/2	1

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Table S. Power Cable Conduit Requirements Powerware 9330 (20 kVA)					
Powerware System	*Voltage*	*Terminal*	*Number of Wires in Conduit*	*Minimum Conduit Trade Size (inches)*	*Number of Conduits*
9330-20/20	208 AC	AC Input to UPS (A, B, C, Gnd)	4	1	1
		AC Input to Bypass (A, B, C, Neut, Gnd)	5	1	1
		Output (A, B, C, Neut, Gnd)	5	1	1
9330-20/20	480 AC	AC Input to UPS (A, B, C, Gnd)	4	1/2	1
		AC Input to Bypass (A, B, C, Neut, Gnd)	5	3/4	1
		Output (A, B, C, Neut, Gnd)	5	3/4	1
9330-20/20	600 AC	AC Input to UPS (A, B, C, Gnd)	4	1/2	1
		AC Input to Bypass (A, B, C, Neut, Gnd)	5	1/2	1
		Output (A, B, C, Neut, Gnd)	5	1/2	1
9330–20/20	288 DC	External Battery DC Source (Positive, Negative, Gnd)	3	3/4	1

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Table T. Power Cable Conduit Requirements Powerware 9330 (25 kVA–30 kVA)					
Powerware System	*Voltage*	*Terminal*	*Number of Wires in Conduit*	*Minimum Conduit Trade Size (inches)*	*Number of Conduits*
9330-40/25	208 AC	AC Input to UPS (A, B, C, Gnd)	4	1-1/4	1
		AC Input to Bypass (A, B, C, Neut, Gnd)	5	1-1/4	1
		Output (A, B, C, Neut, Gnd)	5	1-1/4	1
9330–40/25	480 AC	AC Input to UPS (A, B, C, Gnd)	4	3/4	1
		AC Input to Bypass (A, B, C, Neut, Gnd)	5	3/4	1
		Output (A, B, C, Neut, Gnd)	5	3/4	1
9330–40/25	600 AC	AC Input to UPS (A, B, C, Gnd)	4	1/2	1
		AC Input to Bypass (A, B, C, Neut, Gnd)	5	1/2	1
		Output (A, B, C, Neut, Gnd)	N/A	N/A	N/A
9330–40/25	288 DC	External Battery DC Source (Positive, Negative, Gnd)	3	1	1
9330-40/30	208 AC	AC Input to UPS (A, B, C, Gnd)	4	1-1/4	1
		AC Input to Bypass (A, B, C, Neut, Gnd)	5	1-1/2	1
		Output (A, B, C, Neut, Gnd)	5	1-1/2	1
9330-40/30	480 AC	AC Input to UPS (A, B, C, Gnd)	4	3/4	1
		AC Input to Bypass (A, B, C, Neut, Gnd)	5	3/4	1
		Output (A, B, C, Neut, Gnd)	5	3/4	1
9330-40/30	600 AC	AC Input to UPS (A, B, C, Gnd)	4	1/2	1
		AC Input to Bypass (A, B, C, Neut, Gnd)	5	1/2	1
		Output (A, B, C, Neut, Gnd)	N/A	N/A	N/A
9330–40/30	288 DC	External Battery DC Source (Positive, Negative, Gnd)	3	1	1

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Table U. Power Cable Conduit Requirements Powerware 9330 (35 kVA–40 kVA)

Powerware System	*Voltage*	*Terminal*	*Number of Wires in Conduit*	*Minimum Conduit Trade Size (inches)*	*Number of Conduits*
9330-40/35	208 AC	AC Input to UPS (A, B, C, Gnd)	4	1-1/4	1
		AC Input to Bypass (A, B, C, Neut, Gnd)	5	2	1
		Output (A, B, C, Neut, Gnd)	5	2	1
9330–40/35	480 AC	AC Input to UPS (A, B, C, Gnd)	4	1	1
		AC Input to Bypass (A, B, C, Neut, Gnd)	5	1	1
		Output (A, B, C, Neut, Gnd)	5	1	1
9330–40/35	600 AC	AC Input to UPS (A, B, C, Gnd)	4	3/4	1
		AC Input to Bypass (A, B, C, Neut, Gnd)	5	3/4	1
		Output (A, B, C, Neut, Gnd)	N/A	N/A	N/A
9330–40/35	288 DC	External Battery DC Source (Positive, Negative, Gnd)	3	1	1
9330-40/40	208 AC	AC Input to UPS (A, B, C, Gnd)	4	1-1/2	1
		AC Input to Bypass (A, B, C, Neut, Gnd)	5	2	1
		Output (A, B, C, Neut, Gnd)	5	2	1
9330-40/40	480 AC	AC Input to UPS (A, B, C, Gnd)	4	3/4	1
		AC Input to Bypass (A, B, C, Neut, Gnd)	5	1	1
		Output (A, B, C, Neut, Gnd)	5	1	1
9330-40/40	600 AC	AC Input to UPS (A, B, C, Gnd)	4	3/4	1
		AC Input to Bypass (A, B, C, Neut, Gnd)	5	3/4	1
		Output (A, B, C, Neut, Gnd)	N/A	N/A	N/A
9330–40/40	288 DC	External Battery DC Source (Positive, Negative, Gnd)	3	1-1/4	1

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13. External overcurrent protection is not provided by this product, but is required by codes. Refer to Tables A through M for wiring requirements. If an output lockable disconnect is required, it is to be supplied by designated personnel.

14. Table V lists the maximum rating for input circuit breakers.

Table V. Maximum Input Circuit Breaker Ratings

Powerware System	*Input Voltage Rating*			
	208VAC	480VAC	600VAC	DC
9330–20/10	35	15	15	35
9330–20/15	60	25	20	50
9330–20/20	70	30	25	70
9330–40/25	90	40	40	80
9330–40/30	100	50	40	100
9330–40/35	125	60	40	125
9330–40/40	125	60	50	125

CAUTION: To reduce the risk of fire, connect only to a circuit provided with maximum input circuit breaker current ratings from Table V in accordance with the National Electrical code, ANSI/NFPA 70.

15. When the optional Options Cabinet is used, source protection for the AC input should be treated as if you were supplying a 20 kVA three phase transformer for the Powerware 9330 (10 kVA–20 kVA) and a 40 kVA three phase transformer for the Powerware 9330 (25 kVA–40 kVA), to allow for inrush current.

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16. Output overcurrent protection and output disconnect switch are to be provided by the user. Table W lists the maximum rating for output circuit breakers satisfying the criteria for both.

Table W. Maximum Output Circuit Breaker Ratings

Powerware System	*Output Voltage Rating*		
	208V	480V	600V
9330–20/10	35	15	15
9330–20/15	60	25	20
9330–20/20	70	30	25
9330–40/25	90	40	30
9330–40/30	110	45	40
9330–40/35	125	60	45
9330–40/40	150	60	50

17. Battery voltage is computed at 2 volts per cell as defined by Article 480 of the NEC. Rated battery current is computed at the computed voltage.

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REVISION: D		*DATE:*	053001

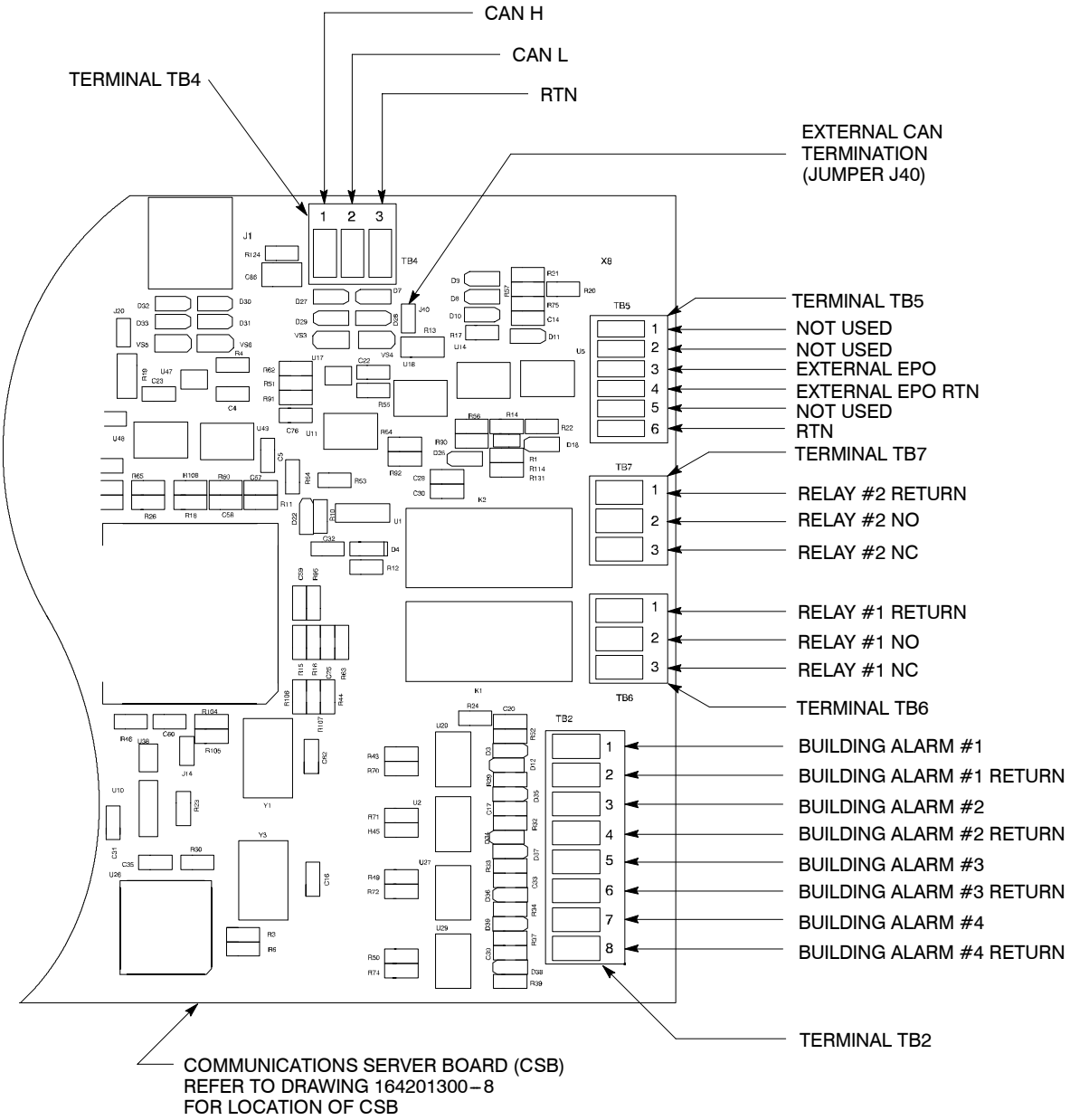
1. Use Class 1 wiring methods (as defined by the NEC) for control wiring. Install the control wiring in separate conduit from the power wiring. The wire should be rated at 150 volts, 5 amp minimum.
2. Refer to Tables X, Y, and Z and to Chapters 2, 5 and 6 of this manual for customer interface wiring.

Table X. Customer Interface Inputs and Outputs

Terminal TB2	Name	Description
1	BLDG ALARM 1	Programmable UPS alarm. Activated by a remote dry contact closure.
2	BLDG ALARM 1 RTN	
3	BLDG ALARM 2	Programmable UPS alarm. Activated by a remote dry contact closure.
4	BLDG ALARM 2 RTN	
5	BLDG ALARM 3	Programmable UPS alarm. Activated by a remote dry contact closure.
6	BLDG ALARM 3 RTN	
7	BLDG ALARM 4	Programmable UPS alarm. Activated by a remote dry contact closure.
8	BLDG ALARM 4 RTN	
Terminal TB4		
1	CAN H	Parallel CAN Input
2	CAN L	
3	RTN	
Terminal TB5		
1		Not Used
2		Not Used
3	EXTERNAL EPO	Dry contact used to activate remote EPO of UPS.
4	EXTERNAL EPO RTN	
5		Not Used
6	RTN	
Terminal TB6		
1	RELAY 1 RTN	General purpose NO and NC relay contacts.
2	RELAY 1 NO	
3	RELAY 1 NC	
Terminal TB7		
1	RELAY 2 RTN	General purpose NO and NC relay contacts.
2	RELAY 2 NO	
3	RELAY 2 NC	
X–Slot 4 Terminal		
1	UTIL_FAIL	Input used to indicate utility power failure
2	ON_BYPASS	Input used to indicate On Bypass status of UPS
3	BATTERY_LOW	Contacts used to indicate Battery Low status of UPS

DESCRIPTION:	**CUSTOMER INTERFACE WIRING INSTALLATION NOTES**		
DRAWING NO:	164201300–2	*SHEET:*	1 of 5
REVISION: G		*DATE:* 051502	

CSB CUSTOMER INTERFACE

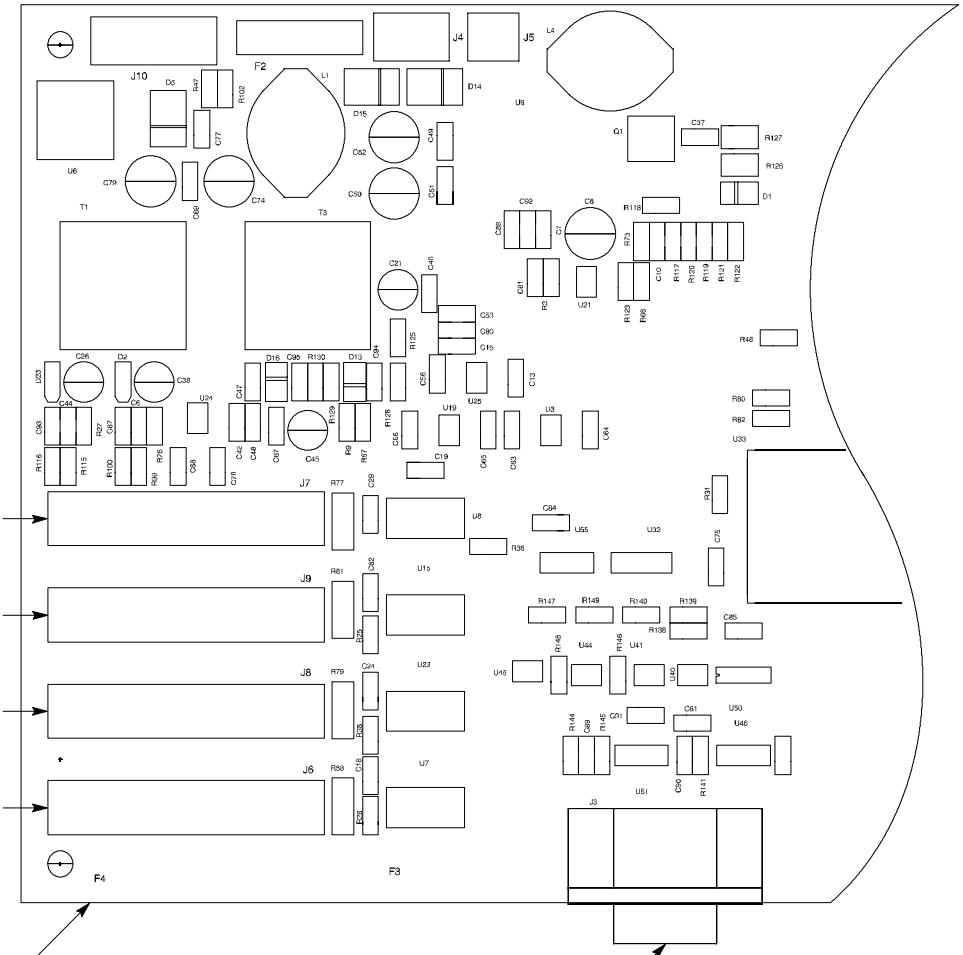


NOTE: *All building alarm inputs or remote features require an isolated normally open contact or switch (rated at 24 VDC, 20 mA minimum) connected between the alarm input and common terminal as shown. All control wiring and relay and switch contacts are customer provided.*

NOTE: *Regardless of assignment, alarms display as Building Alarm 1, Building Alarm 2, etc., on Monitor Panel. Use twisted pair wires for each alarm input and common.*

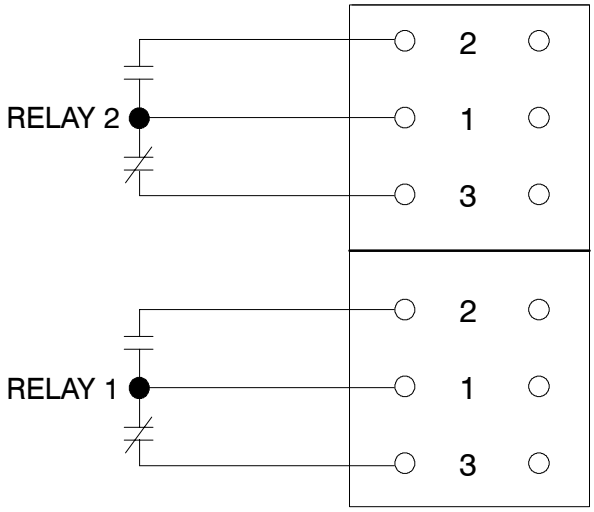
DESCRIPTION:	**CUSTOMER INTERFACE WIRING INSTALLATION NOTES**	
DRAWING NO: 164201300–2		*SHEET:* 2 of 5
REVISION: G	*DATE:* 061502	

CSB CUSTOMER INTERFACE


X – SLOT 2 RIBBON CONNECTOR
X – SLOT 4 RIBBON CONNECTOR
(AS400 Slot)
X – SLOT 3 RIBBON CONNECTOR
X – SLOT 1 RIBBON CONNECTOR
COMMUNICATIONS SERVER BOARD (CSB)
REFER TO DRAWING 164201300 – 8
FOR LOCATION OF CSB
SERIAL PORT

DESCRIPTION:	**CUSTOMER INTERFACE WIRING INSTALLATION NOTES**		
DRAWING NO:	164201300 – 2	*SHEET:*	3 of 5
REVISION:	G	*DATE:*	061502

Table Y. Summary Alarm Relay Contacts



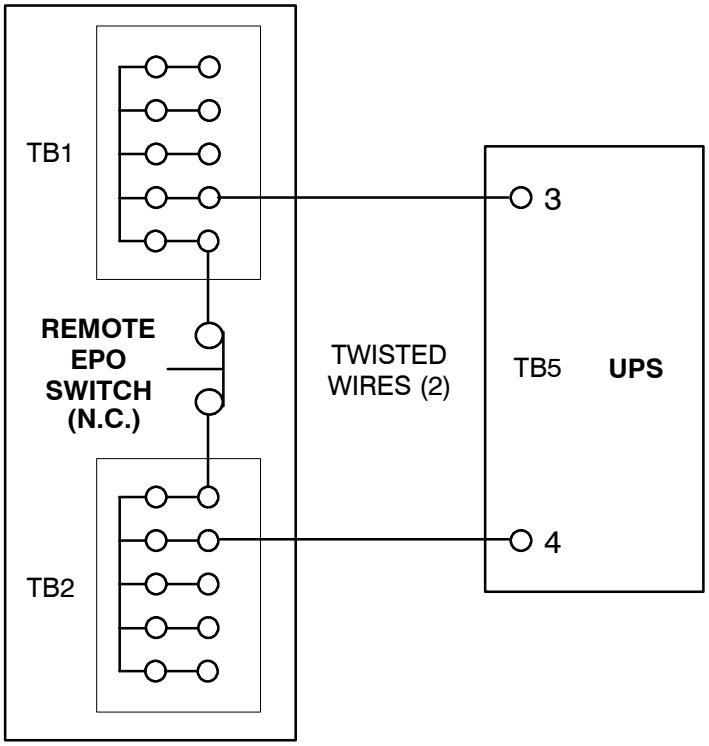
CONTACT RATING:	
Maximum Switched Voltage: 120 VAC	Maximum Carrying Current: 5A

NOTE: Relays are shown in de-energized state. Relays change state when the UPS is in normal operating mode.

DESCRIPTION:	**CUSTOMER INTERFACE WIRING INSTALLATION NOTES**		
DRAWING NO:	164201300–2	*SHEET:*	4 of 5
REVISION: G		*DATE:*	051502

3. The Remote EPO feature opens all breakers and contactors in the UPS cabinet and isolates power from your critical load. Local electrical codes may also require tripping upstream protective devices to the UPS.

Table Z Remote EPO



Remote EPO switch rating is 24 VDC, 1 Amp minimum.

NOTE: This switch must be a dedicated switch not tied into any other circuits.

DESCRIPTION:	**CUSTOMER INTERFACE WIRING INSTALLATION NOTES**		
DRAWING NO:	164201300–2	*SHEET:*	5 of 5
REVISION:	G	*DATE:*	051502

1. The UPS equipment operating environment must meet the size and weight requirements shown in Table AA, according to your UPS system configuration.
2. In the UPS system, the UPS, Options, and Battery cabinets are palleted separately for shipping.
3. Do not tilt cabinets more than ±10° during handling.
4. Dimensions are in millimeters (inches).

Table AA. Equipment Weight

Component	*Weight Kg (lb)*		
	Shipping	*Installed*	Point Loading
UPS Cabinet with Filter and Batteries Powerware 9330 (10 kVA–20 kVA)	461 (1017)	435 (958)	6 at 73 (160)
UPS Cabinet with Filter and Batteries Powerware 9330 (25 kVA–40 kVA)	873 (1925)	838 (1847)	9 at 93 (205)
Options Cabinet with PDM and no transformer Powerware 9330 (10 kVA–20 kVA)	118 (260)	90 (200)	4 at 23 (50)
Options Cabinet with PDM and 1 transformer Powerware 9330 (10 kVA–20 kVA)	240 (530)	213 (470)	4 at 53 (118)
Options Cabinet with PDM and 2 transformers Powerware 9330 (10 kVA–20 kVA)	358 (790)	331 (730)	4 at 83 (183)
Options Cabinet with PDM and no transformer Powerware 9330 (25 kVA–40 kVA)	154 (340)	120 (265)	6 at 20 (44)
Options Cabinet with PDM and 1 transformer Powerware 9330 (25 kVA–40 kVA)	471 (1040)	437 (965)	6 at 73 (161)
Options Cabinet with PDM and 2 transformers Powerware 9330 (25 kVA–40 kVA)	782 (1725)	748 (1650)	6 at 125 (275)
Battery Cabinet	361 (795)	333 (735)	6 at 56 (123)

NOTES:

Powerware 9330 (10 kVA–20 kVA)
1. For UPS Cabinet without Filter, subtract 25 Kg (55 lb).
2. For UPS Cabinet without Batteries, subtract 227 Kg (499 lb)
3. For Options Cabinet without PDM, subtract 11 Kg (25 lb)

Powerware 9330 (25 kVA–40 kVA)
1. For UPS Cabinet without Filter, subtract 41 Kg (90 lb).
2. For UPS Cabinet without Batteries, subtract 453 Kg (998 lb)
3. For Options Cabinet without PDM, subtract 11 Kg (25 lb)

5. The clearances required around the UPS System are shown in Table AB.

Table AB. System Clearances

From Front of Cabinet	36 inches working space
From Back of Cabinet	12 inches air circulation clearance
From Sides of Cabinet	Allow space for Options and Battery Cabinets

DESCRIPTION: **PHYSICAL FEATURES AND REQUIREMENTS**			
DRAWING NO:	164201300–3	*SHEET:*	1 of 2
REVISION:	G	*DATE:*	061502

6. The basic environmental requirements for operation of the UPS system are:

Ambient Temperature Range: 0–40˚C (32–104˚F)

Recommended Operating Range: 20–25˚C (68–77˚F)

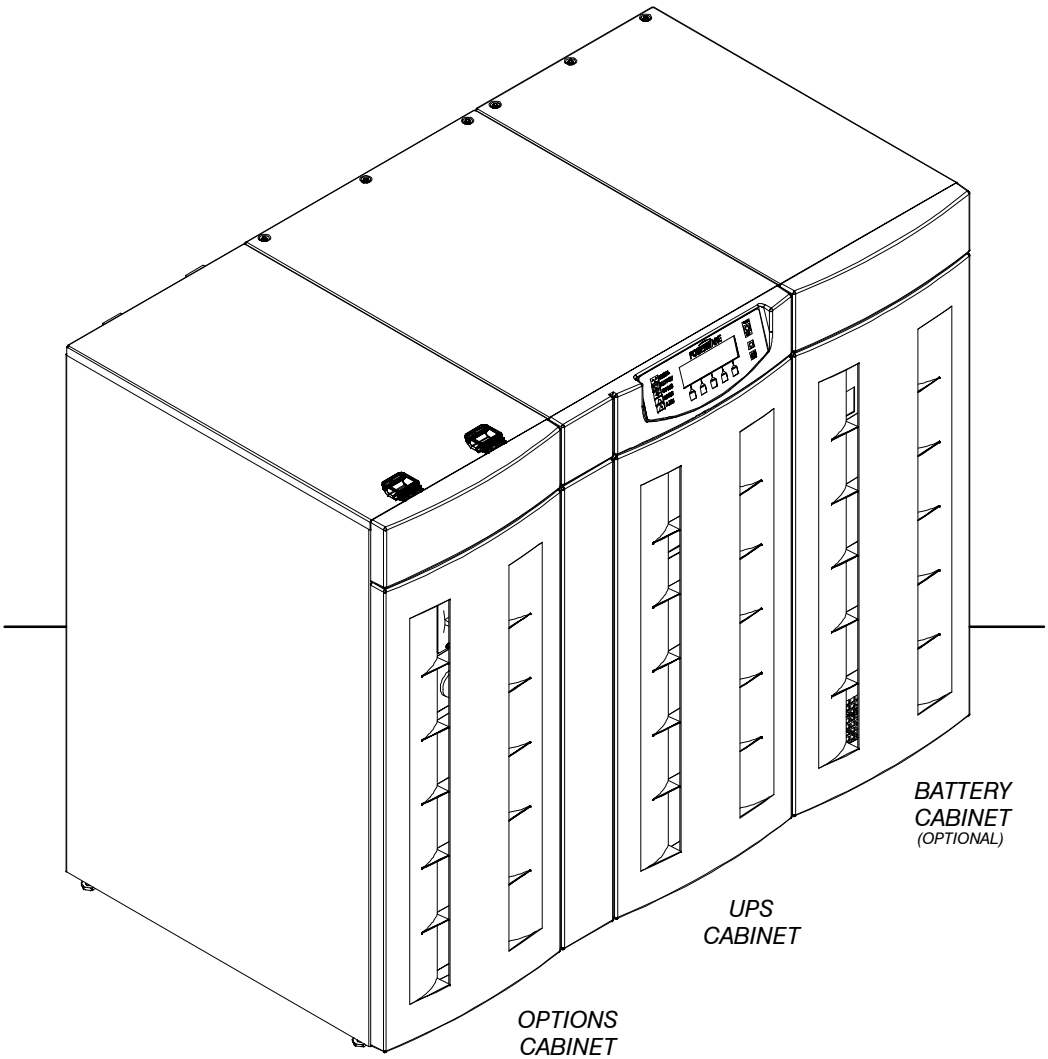
Maximum Relative Humidity: 95%, noncondensing

The UPS ventilation requirements are shown in Table AC.

Table AC. Air Conditioning or Ventilation Requirements During Full Load Operation
Powerware 9330 (10 kVA–40 kVA)

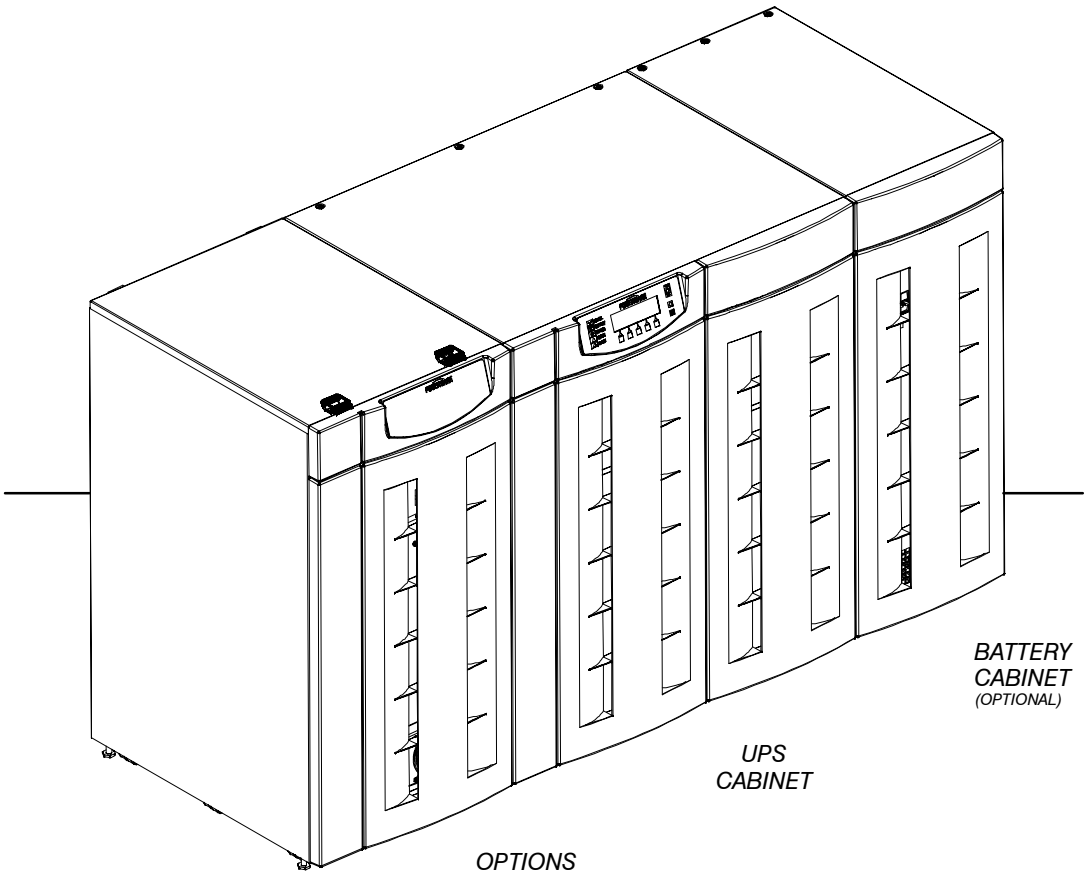
Ratings	*Input/Output Voltage*	Heat Rejection* BTU/hr × 1000/hr (Kg–cal/hr)
10 KVA	208/208	2.4 (0.6)
	480/208	3.1 (0.8)
	480/480, 600/208	3.6 (0.9)
15 KVA	208/208	3.5 (0.9)
	480/208	4.6 (1.1)
	480/480, 600/208	5.3 (1.3)
20 KVA	208/208	4.7 (1.2)
	480/208, 600/208	6.1 (1.5)
	480/480	7.1 (1.8)
25 KVA	208/208	5.9 (1.5)
	480/208, 600/208	7.7 (1.9)
	480/480	8.9 (2.2)
30 KVA	208/208	7.1 (1.8)
	480/208, 600/208	9.2 (2.3)
	480/480	10.7 (2.7)
35 KVA	208/208	8.3 (2.1)
	480/208, 600/208	10.8 (2.7)
	480/480	12.5 (3.1)
40 KVA	208/208	9.5 (2.4)
	480/208, 600/208	12.4 (3.1)
	480/480	14.3 (3.6)

DESCRIPTION: **PHYSICAL FEATURES AND REQUIREMENTS**			
DRAWING NO:	164201300–3	*SHEET:*	2 of 2
REVISION:	G	*DATE:*	061502



POWERWARE 9330 (10 kVA–20 kVA)

DESCRIPTION:	**TYPICAL UPS SYSTEM**		
DRAWING NO:	164201300–4	*SHEET:*	1 of 2
REVISION: D		*DATE:*	053001



POWERWARE 9330 (25 kVA–40 kVA)

DESCRIPTION:	**TYPICAL UPS SYSTEM**		
DRAWING NO:	164201300–4	*SHEET:*	2 of 2
REVISION: G		*DATE:*	061502

Table AD. UPS System Configurations Oneline			
Oneline Drawing 164201300–6	Powerware Model	Vin / Vout	System Type
Sheet 1	9330–20/10	208/208	Single Module – Reverse Transfer
	9330–20/15		
	9330–20/20		
	9330–40/25		
	9330–40/30		
	9330–40/35		
	9330–40/40		

Table AE. UPS System Configurations Schematics			
Schematic Drawing 164201300–7	Powerware Model	Vin / Vout	System Type
Sheet 1	9330–20/10	208/208 480/208 600/208	Single Module – Reverse Transfer Single or Dual Feed with Input Isolation Transformers, Bypass Switch and Optional Distribution Panel
	9330–20/15		
	9330–20/20		
Sheet 2	9330–20/10	208/208	Single Module – Reverse Transfer Single or Dual Feed with Bypass Switch and Optional Distribution Panel
	9330–20/15		
	9330–20/20		
Sheet 3	9330–20/10	208/208 208/480	Single Module – Reverse Transfer Single or Dual Feed with Output Isolation Transformer, Bypass Switch and Optional Distribution Panel
	9330–20/15		
	9330–20/20		
Sheet 4	9330–20/10	208/208 208/480 480/208 480/480 600/208 600/480	Single Module – Reverse Transfer Single Feed with Input and Output Isolation Transformers, Bypass Switch and Optional Distribution Panel
	9330–20/15		
	9330–20/20		
Sheet 5	9330–20/10	208/208 208/480 480/208 480/480 600/208 600/480	Single Module – Reverse Transfer Dual Feed with Input and Output Isolation Transformers, Bypass Switch and Optional Distribution Panel
	9330–20/15		
	9330–20/20		

NOTE 1: A bypass neutral feeder must be supplied.

NOTE 2: Output Voltage must match Bypass Input Voltage.

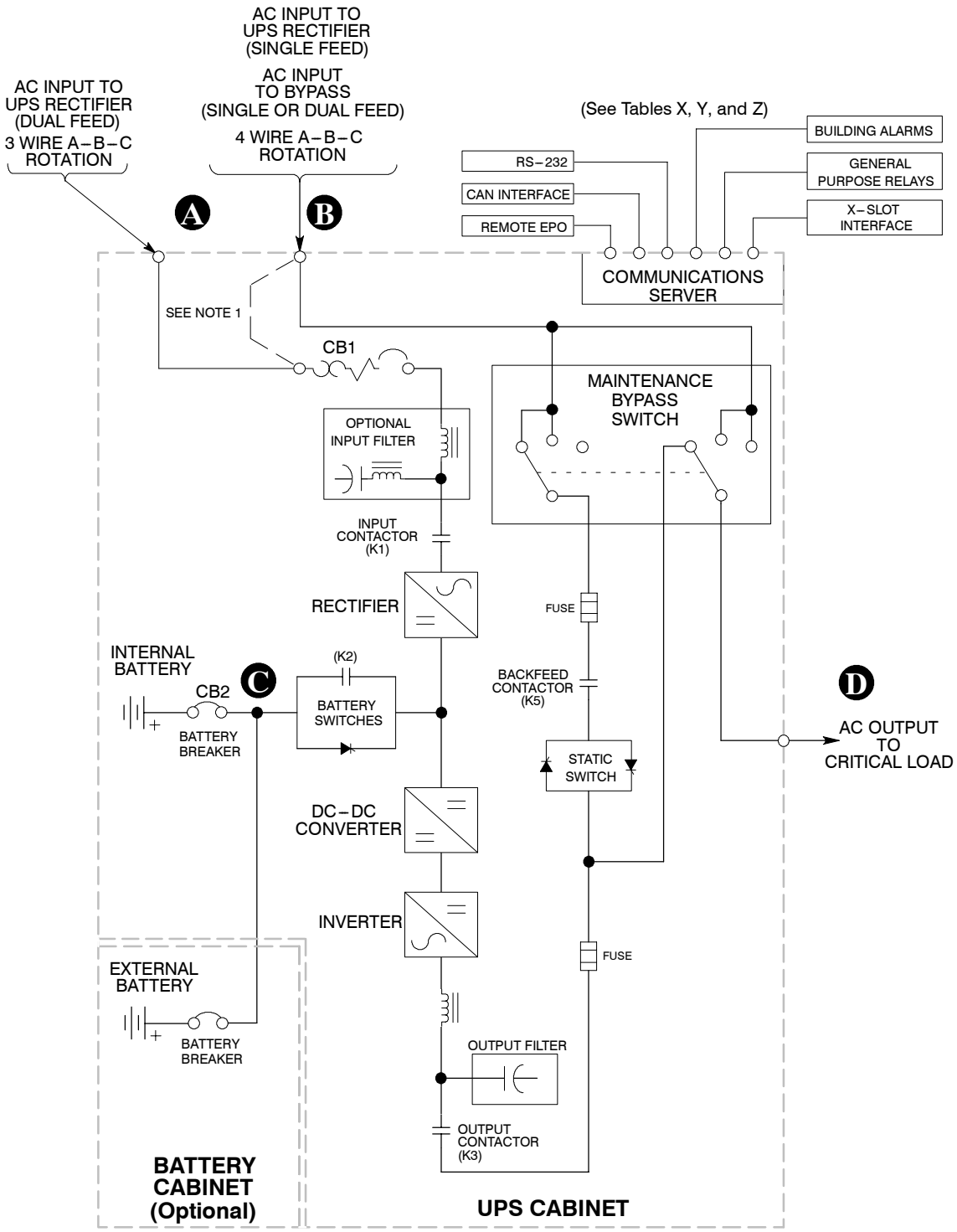
DESCRIPTION:	**UPS SYSTEM CONFIGURATIONS**		
DRAWING NO:	164201300–5	*SHEET:*	1 of 2
REVISION: F		*DATE:*	111501

Table AE. UPS System Configurations Schematics (Cont'd)			
Schematic Drawing 164201300–7	Powerware Model	Vin / Vout	System Type
Sheet 6	9330–40/25 9330–40/30 9330–40/35 9330–40/40	208/208 480/208 600/208	Single Module – Reverse Transfer Single or Dual Feed with Input Isolation Transformers, Bypass Switch and Optional Distribution Panel
Sheet 7	9330–40/25 9330–40/30 9330–40/35 9330–40/40	208/208	Single Module – Reverse Transfer Single or Dual Feed with Bypass Switch and Optional Distribution Panel
Sheet 8	9330–40/25 9330–40/30 9330–40/35 9330–40/40	208/208 208/480	Single Module – Reverse Transfer Single or Dual Feed with Output Isolation Transformer, Bypass Switch and Optional Distribution Panel
Sheet 9	9330–40/25 9330–40/30 9330–40/35 9330–40/40	208/208 208/480 480/208 480/480 600/208 600/480	Single Module – Reverse Transfer Single Feed with Input and Output Isolation Transformers, Bypass Switch and Optional Distribution Panel
Sheet 10	9330–40/25 9330–40/30 9330–40/35 9330–40/40	208/208 208/480 480/208 480/480 600/208 600/480	Single Module – Reverse Transfer Dual Feed with Input and Output Isolation Transformers, Bypass Switch and Optional Distribution Panel

NOTE 1: A bypass neutral feeder must be supplied.

NOTE 2: Output Voltage must match Bypass Input Voltage.

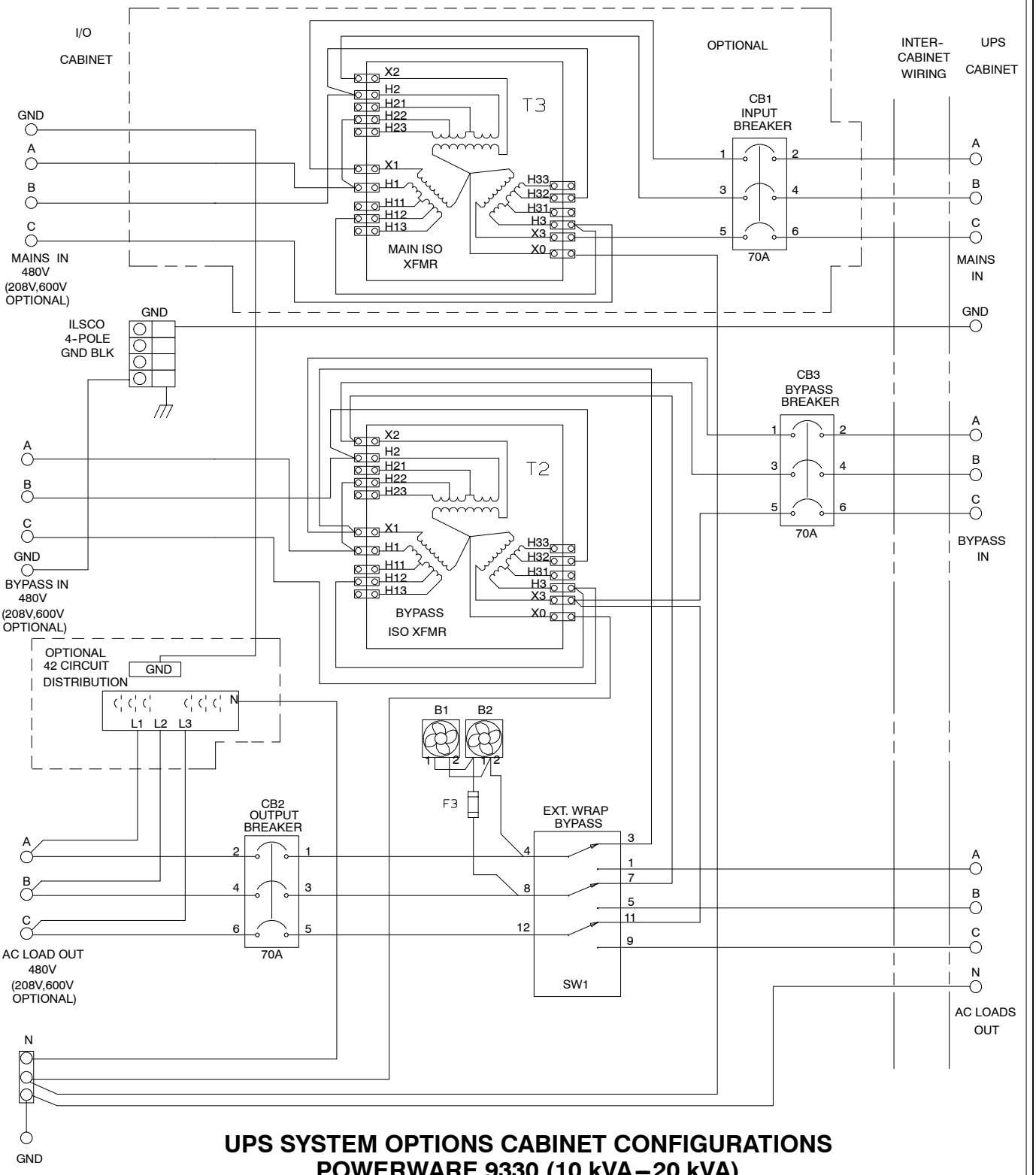
DESCRIPTION:	**UPS SYSTEM CONFIGURATIONS**		
DRAWING NO:	164201300–5	*SHEET:*	2 of 2
REVISION: F		*DATE:*	111501



UPS SYSTEM WITH 208V INPUT AND OUTPUT, SINGLE OR DUAL FEED
POWERWARE 9330 (10 kVA–20 kVA)
POWERWARE 9330 (25 kVA–40 kVA)

NOTE 1: Remove jumper for dual feed.

DESCRIPTION:	**ONELINE DRAWINGS OF UPS SYSTEM**		
DRAWING NO:	164201300–6	*SHEET:*	1 of 1
REVISION:	G	*DATE:*	031502



UPS SYSTEM OPTIONS CABINET CONFIGURATIONS
POWERWARE 9330 (10 kVA–20 kVA)

CONFIGURATION 1

DUAL FEED; DUAL INPUT TRANSFORMERS; BYPASS SWITCH; WITH DISTRIBUTION

CONFIGURATION 2

DUAL FEED; DUAL INPUT TRANSFORMERS; BYPASS SWITCH; WITHOUT DISTRIBUTION

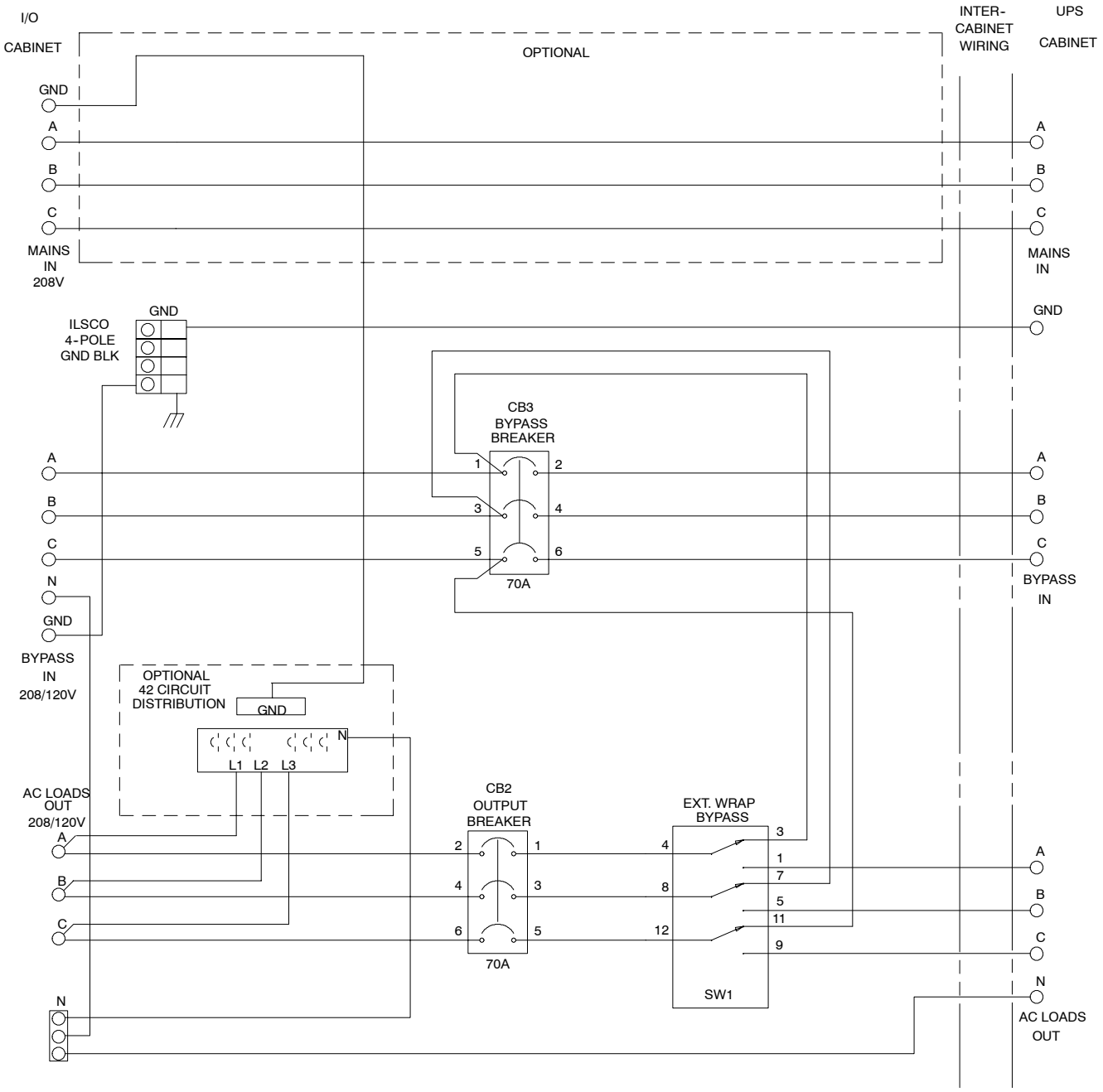
CONFIGURATION 12

SINGLE FEED; INPUT TRANSFORMER; BYPASS SWITCH; WITH DISTRIBUTION

CONFIGURATION 13

SINGLE FEED; INPUT TRANSFORMER; BYPASS SWITCH; WITHOUT DISTRIBUTION

DESCRIPTION:	**OPTIONS CABINET SCHEMATICS**		
DRAWING NO:	164201300–7	*SHEET:*	1 of 10
REVISION:	F	*DATE:*	111501



UPS SYSTEM OPTIONS CABINET CONFIGURATIONS
POWERWARE 9330 (10 kVA–20 kVA)

CONFIGURATION 4

DUAL FEED; BYPASS SWITCH;
WITH DISTRIBUTION

CONFIGURATION 5

DUAL FEED; BYPASS SWITCH;
WITHOUT DISTRIBUTION

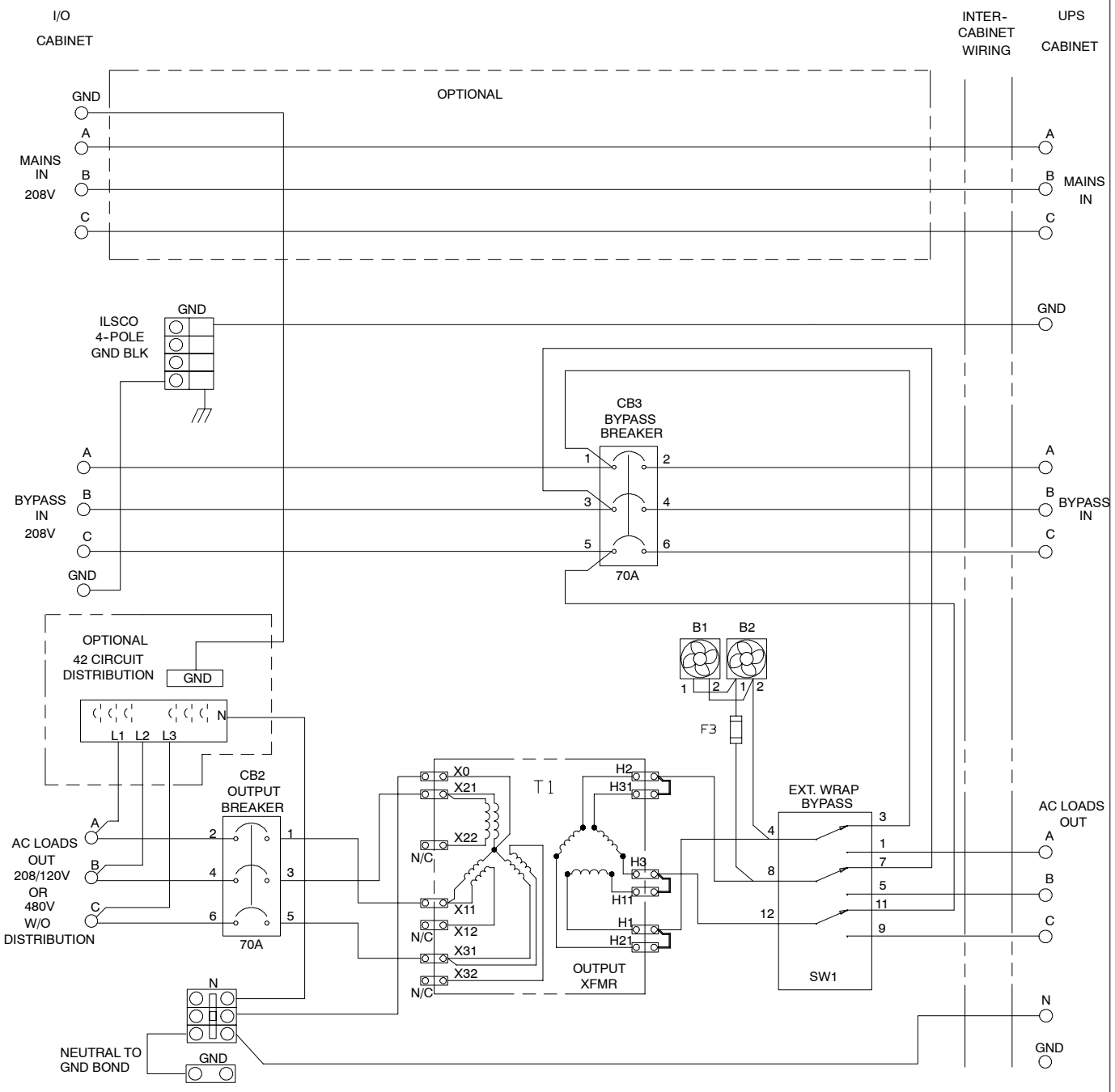
CONFIGURATION 10

SINGLE FEED; BYPASS SWITCH;
WITH DISTRIBUTION

CONFIGURATION 11

SINGLE FEED; BYPASS SWITCH;
WITHOUT DISTRIBUTION

DESCRIPTION:	**OPTIONS CABINET SCHEMATICS**		
DRAWING NO:	164201300–7	*SHEET:*	2 of 10
REVISION:	F	*DATE:*	111501



UPS SYSTEM OPTIONS CABINET CONFIGURATIONS
POWERWARE 9330 (10 kVA–20 kVA)

CONFIGURATION 6

SINGLE FEED; OUTPUT TRANSFORMER; BYPASS SWITCH; WITH DISTRIBUTION

CONFIGURATION 7

SINGLE FEED; OUTPUT TRANSFORMER; BYPASS SWITCH; WITHOUT DISTRIBUTION

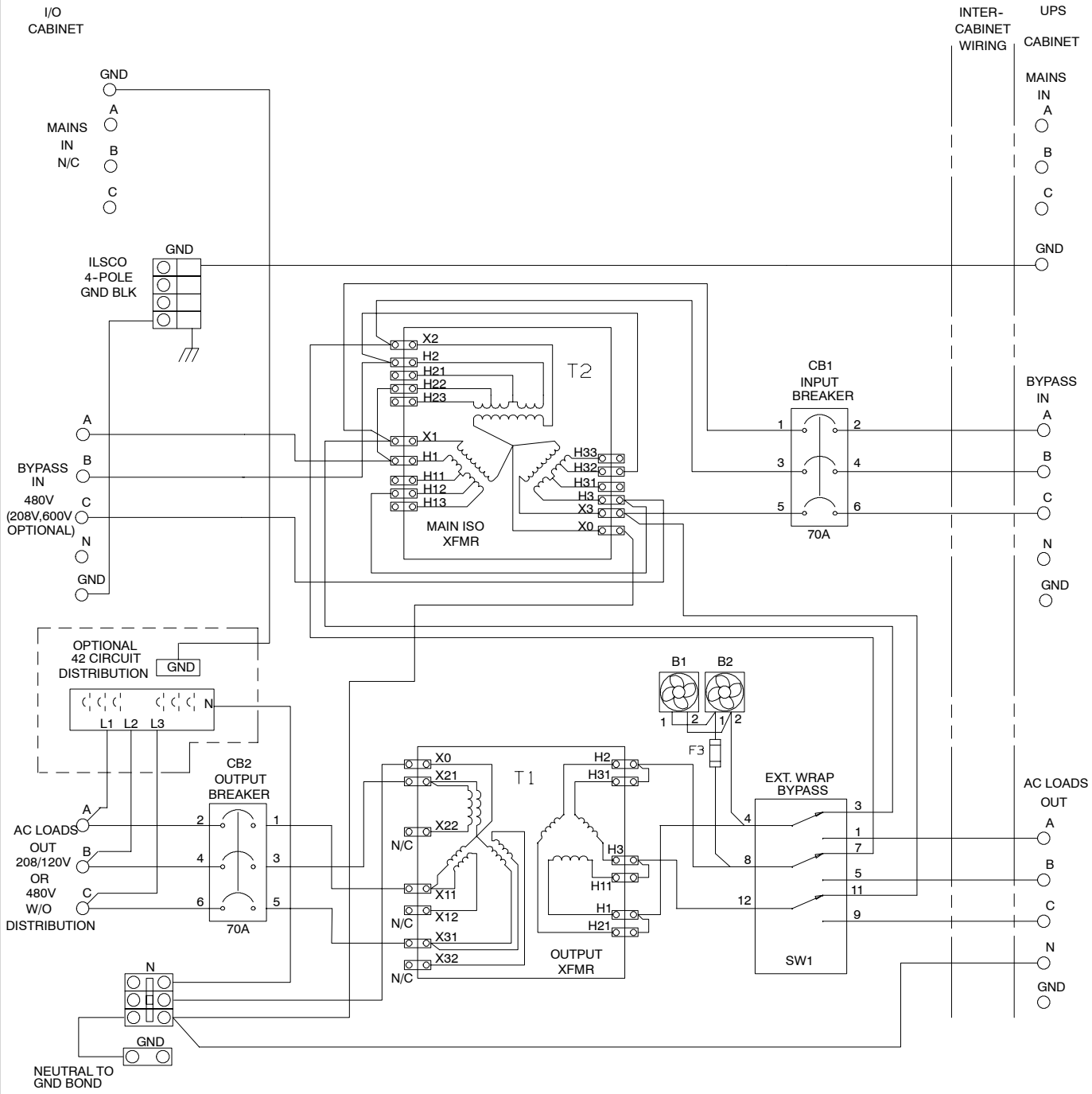
CONFIGURATION 14

DUAL FEED; OUTPUT TRANSFORMER; BYPASS SWITCH; WITH DISTRIBUTION

CONFIGURATION 15

DUAL FEED; OUTPUT TRANSFORMER; BYPASS SWITCH; WITHOUT DISTRIBUTION

DESCRIPTION:	**OPTIONS CABINET SCHEMATICS**		
DRAWING NO:	164201300–7	*SHEET:*	3 of 10
REVISION:	F	*DATE:*	111501



UPS SYSTEM OPTIONS CABINET CONFIGURATIONS
POWERWARE 9330 (10 kVA–20 kVA)

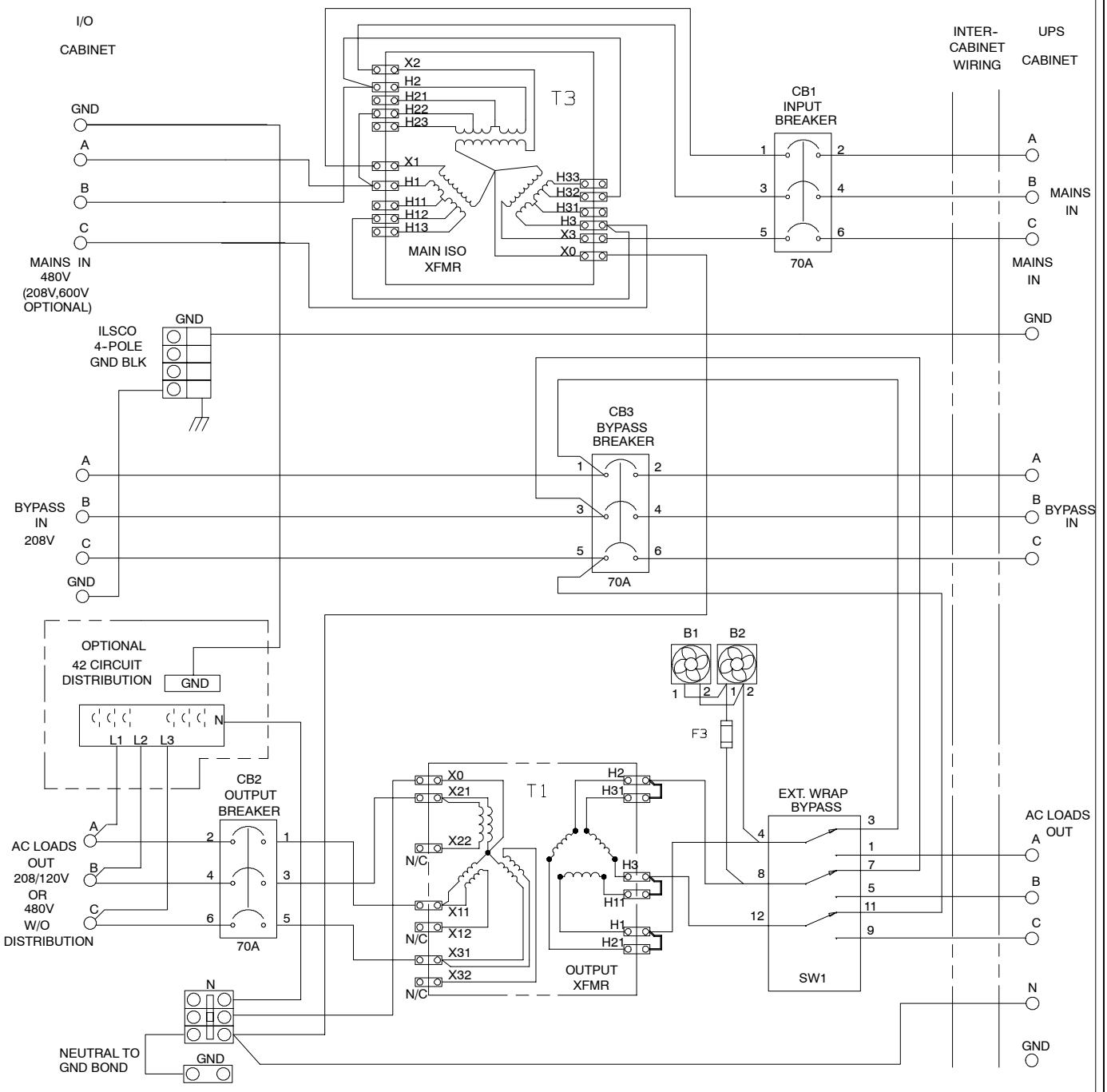
CONFIGURATION 8

SINGLE FEED; INPUT AND OUTPUT TRANSFORMERS; BYPASS SWITCH; WITH DISTRIBUTION

CONFIGURATION 9

SINGLE FEED; INPUT AND OUTPUT TRANSFORMERS; BYPASS SWITCH; WITHOUT DISTRIBUTION

DESCRIPTION:	**OPTIONS CABINET SCHEMATICS**		
DRAWING NO:	164201300–7	*SHEET:*	4 of 10
REVISION:	F	*DATE:*	111501



UPS SYSTEM OPTIONS CABINET CONFIGURATIONS
POWERWARE 9330 (10 kVA–20 kVA)

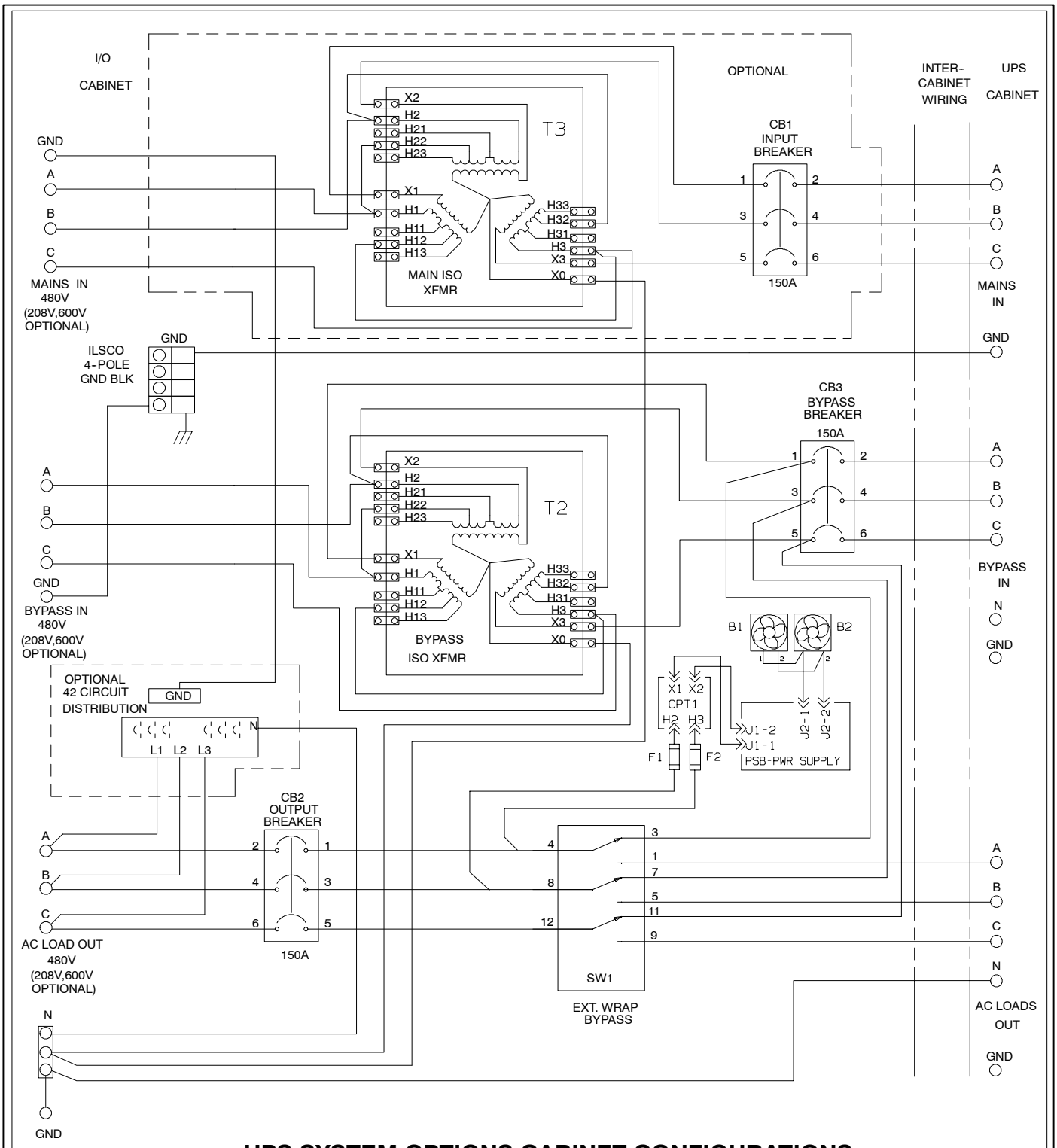
CONFIGURATION 16

DUAL FEED; INPUT AND OUTPUT TRANSFORMERS;
BYPASS SWITCH; WITH DISTRIBUTION

CONFIGURATION 17

DUAL FEED; INPUT AND OUTPUT TRANSFORMERS;
BYPASS SWITCH; WITHOUT DISTRIBUTION

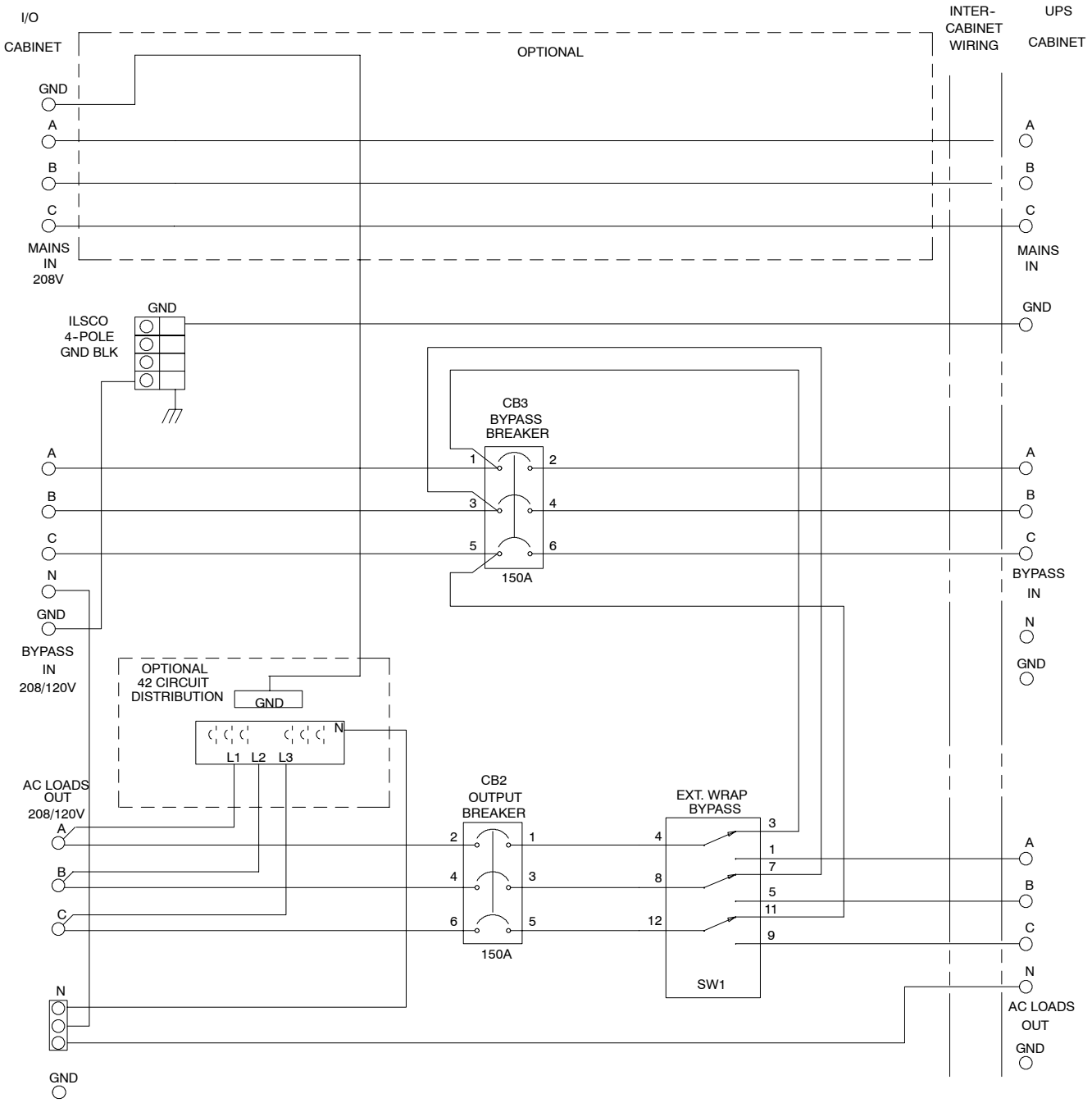
DESCRIPTION:	**OPTIONS CABINET SCHEMATICS**		
DRAWING NO:	164201300–7	*SHEET:*	5 of 10
REVISION:	F	*DATE:*	111501



UPS SYSTEM OPTIONS CABINET CONFIGURATIONS
POWERWARE 9330 (25 kVA–40 kVA)

CONFIGURATION 1 DUAL FEED; DUAL INPUT TRANSFORMERS; BYPASS SWITCH; WITH DISTRIBUTION	CONFIGURATION 2 DUAL FEED; DUAL INPUT TRANSFORMERS; BYPASS SWITCH; WITHOUT DISTRIBUTION
CONFIGURATION 12 SINGLE FEED; INPUT TRANSFORMER; BYPASS SWITCH; WITH DISTRIBUTION	CONFIGURATION 13 SINGLE FEED; INPUT TRANSFORMER; BYPASS SWITCH; WITHOUT DISTRIBUTION

DESCRIPTION:	**OPTIONS CABINET SCHEMATICS**		
DRAWING NO:	164201300–7	*SHEET:*	6 of 10
REVISION:	F	*DATE:*	111501



UPS SYSTEM OPTIONS CABINET CONFIGURATIONS
POWERWARE 9330 (25 kVA–40 kVA)

CONFIGURATION 4

DUAL FEED; BYPASS SWITCH;
WITH DISTRIBUTION

CONFIGURATION 5

DUAL FEED; BYPASS SWITCH;
WITHOUT DISTRIBUTION

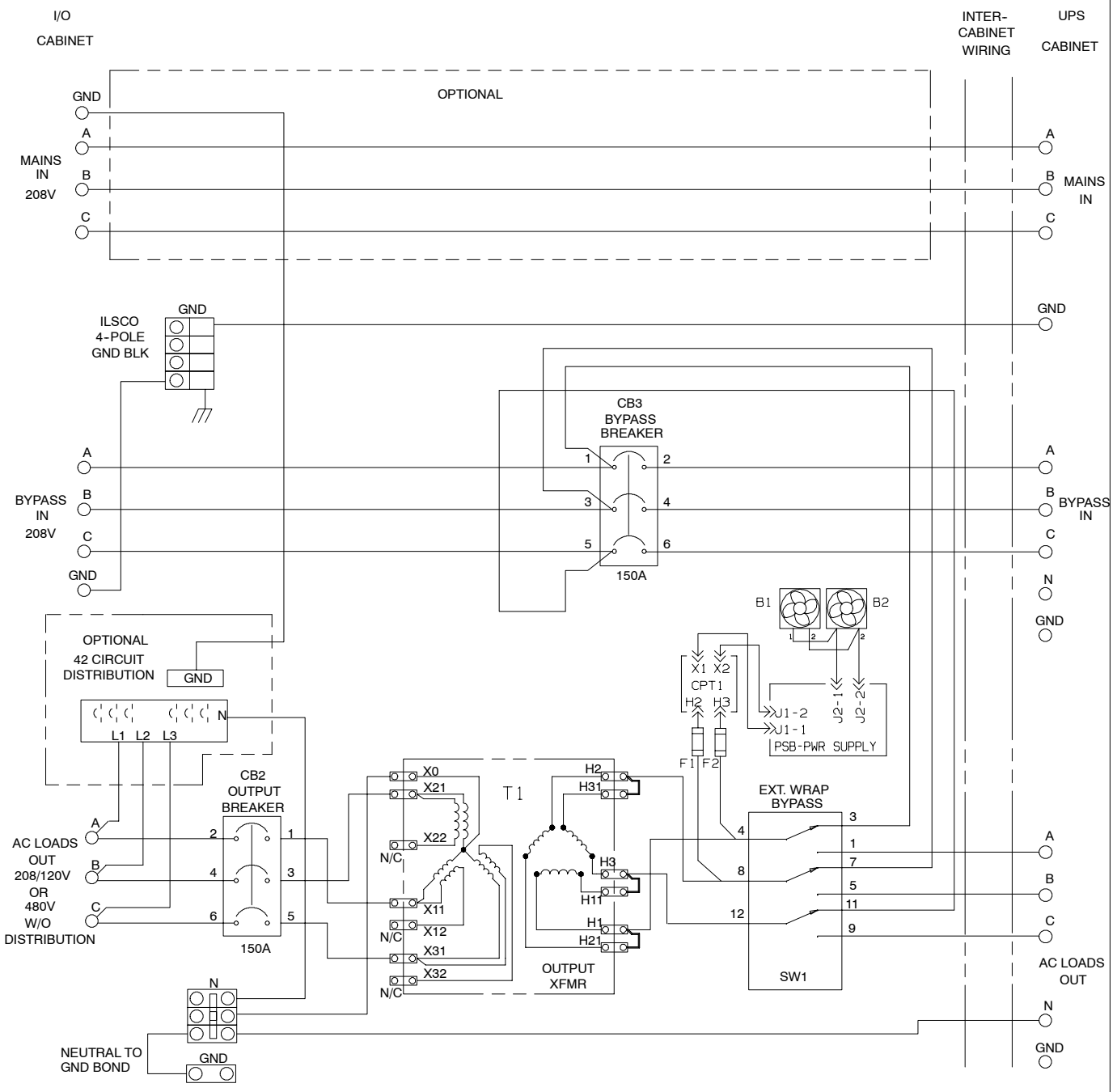
CONFIGURATION 10

SINGLE FEED; BYPASS SWITCH;
WITH DISTRIBUTION

CONFIGURATION 11

SINGLE FEED; BYPASS SWITCH;
WITHOUT DISTRIBUTION

DESCRIPTION:	**OPTIONS CABINET SCHEMATICS**		
DRAWING NO:	164201300–7	*SHEET:*	7 of 10
REVISION:	F	*DATE:*	111501



UPS SYSTEM OPTIONS CABINET CONFIGURATIONS
POWERWARE 9330 (25 kVA–40 kVA)

CONFIGURATION 6

SINGLE FEED; OUTPUT TRANSFORMER; BYPASS SWITCH; WITH DISTRIBUTION

CONFIGURATION 7

SINGLE FEED; OUTPUT TRANSFORMER; BYPASS SWITCH; WITHOUT DISTRIBUTION

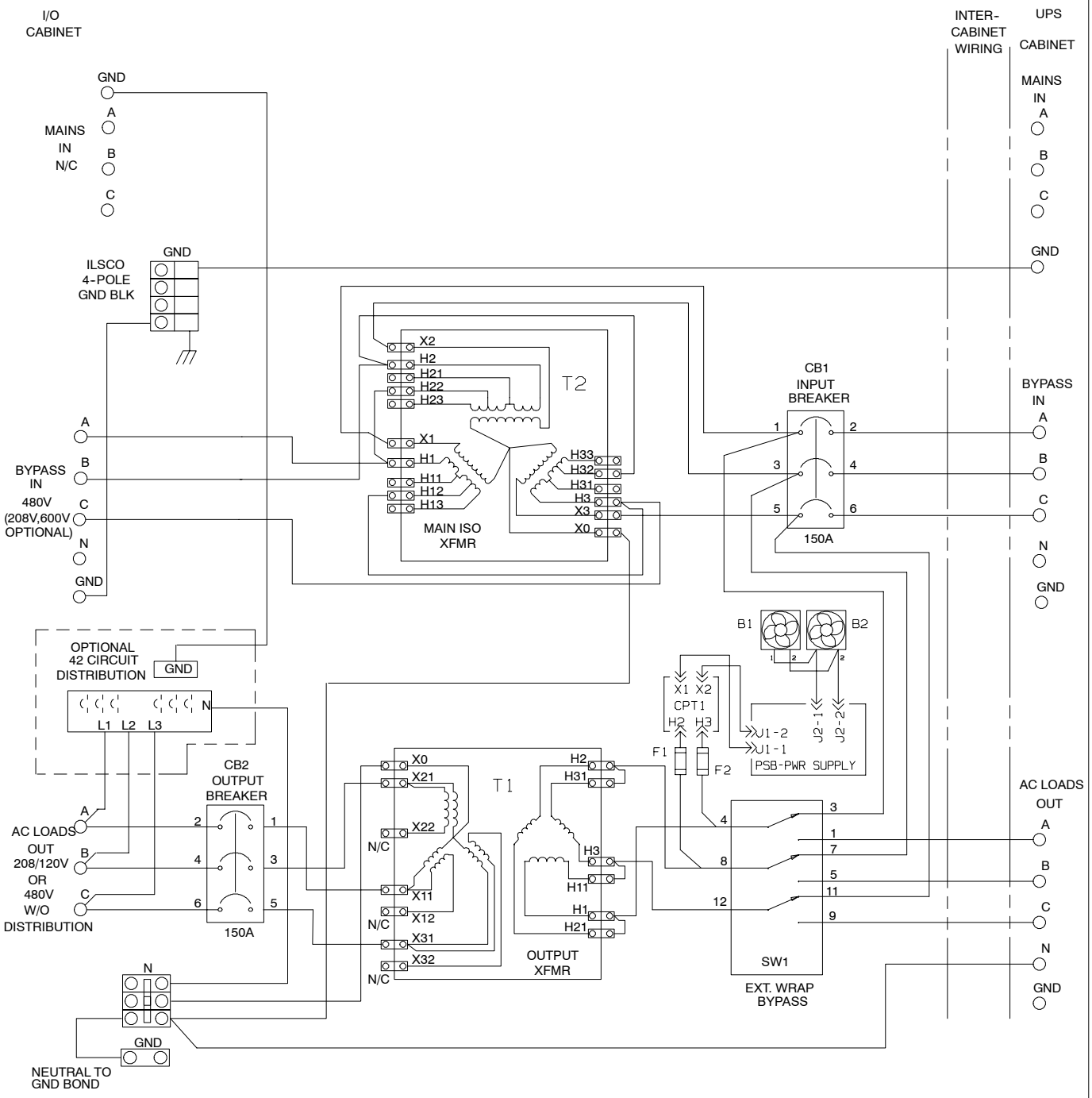
CONFIGURATION 14

DUAL FEED; OUTPUT TRANSFORMER; BYPASS SWITCH; WITH DISTRIBUTION

CONFIGURATION 15

DUAL FEED; OUTPUT TRANSFORMER; BYPASS SWITCH; WITHOUT DISTRIBUTION

DESCRIPTION:	**OPTIONS CABINET SCHEMATICS**		
DRAWING NO:	164201300–7	*SHEET:*	8 of 10
REVISION:	F	*DATE:*	111501



UPS SYSTEM OPTIONS CABINET CONFIGURATIONS
POWERWARE 9330 (25 kVA–40 kVA)

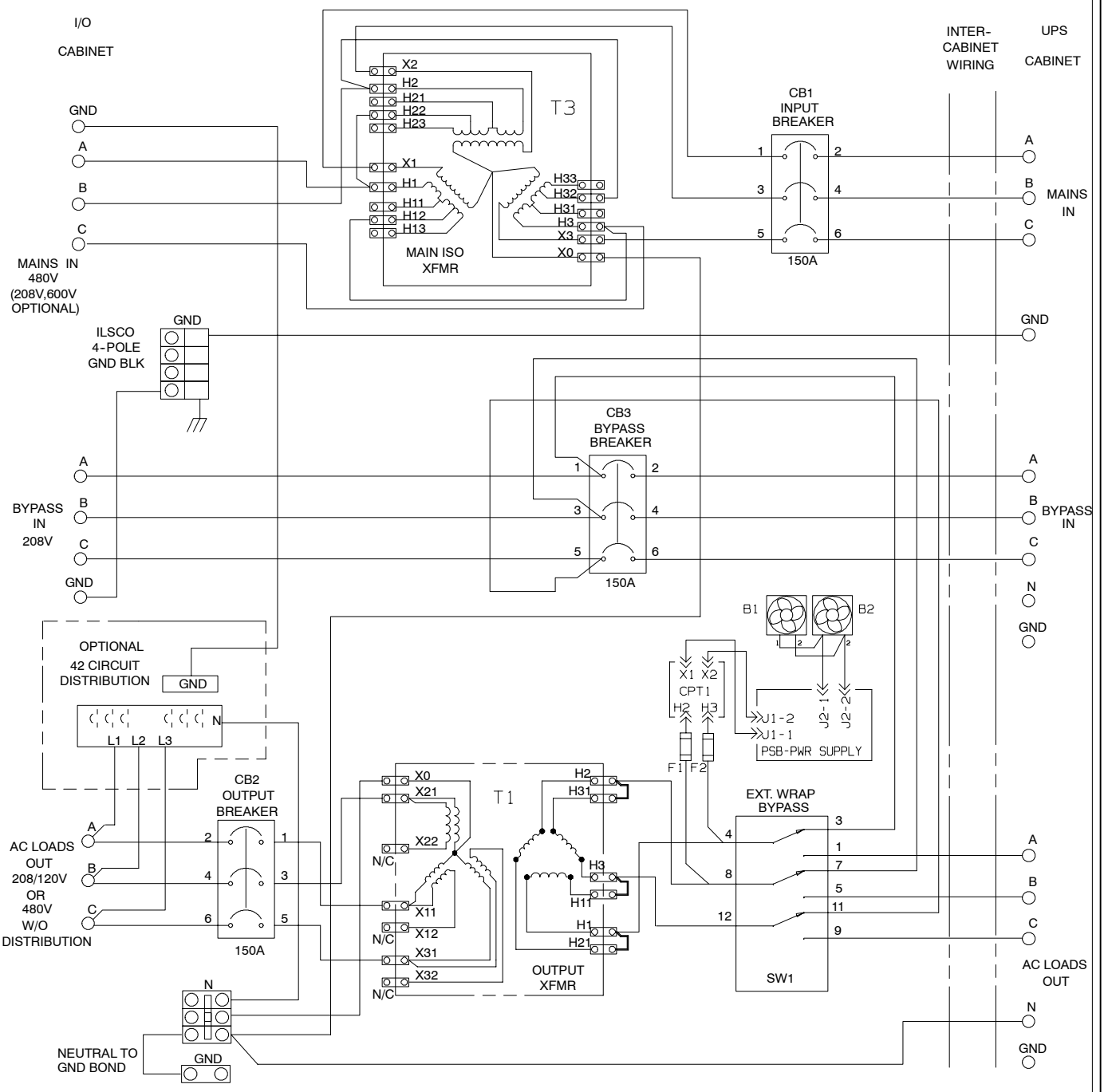
CONFIGURATION 8

SINGLE FEED; INPUT AND OUTPUT TRANSFORMERS;
BYPASS SWITCH; WITH DISTRIBUTION

CONFIGURATION 9

SINGLE FEED; INPUT AND OUTPUT TRANSFORMERS;
BYPASS SWITCH; WITHOUT DISTRIBUTION

DESCRIPTION:	**OPTIONS CABINET SCHEMATICS**		
DRAWING NO:	164201300–7	*SHEET:*	9 of 10
REVISION:	F	*DATE:*	111501



UPS SYSTEM OPTIONS CABINET CONFIGURATIONS
POWERWARE 9330 (25 kVA–40 kVA)

CONFIGURATION 16

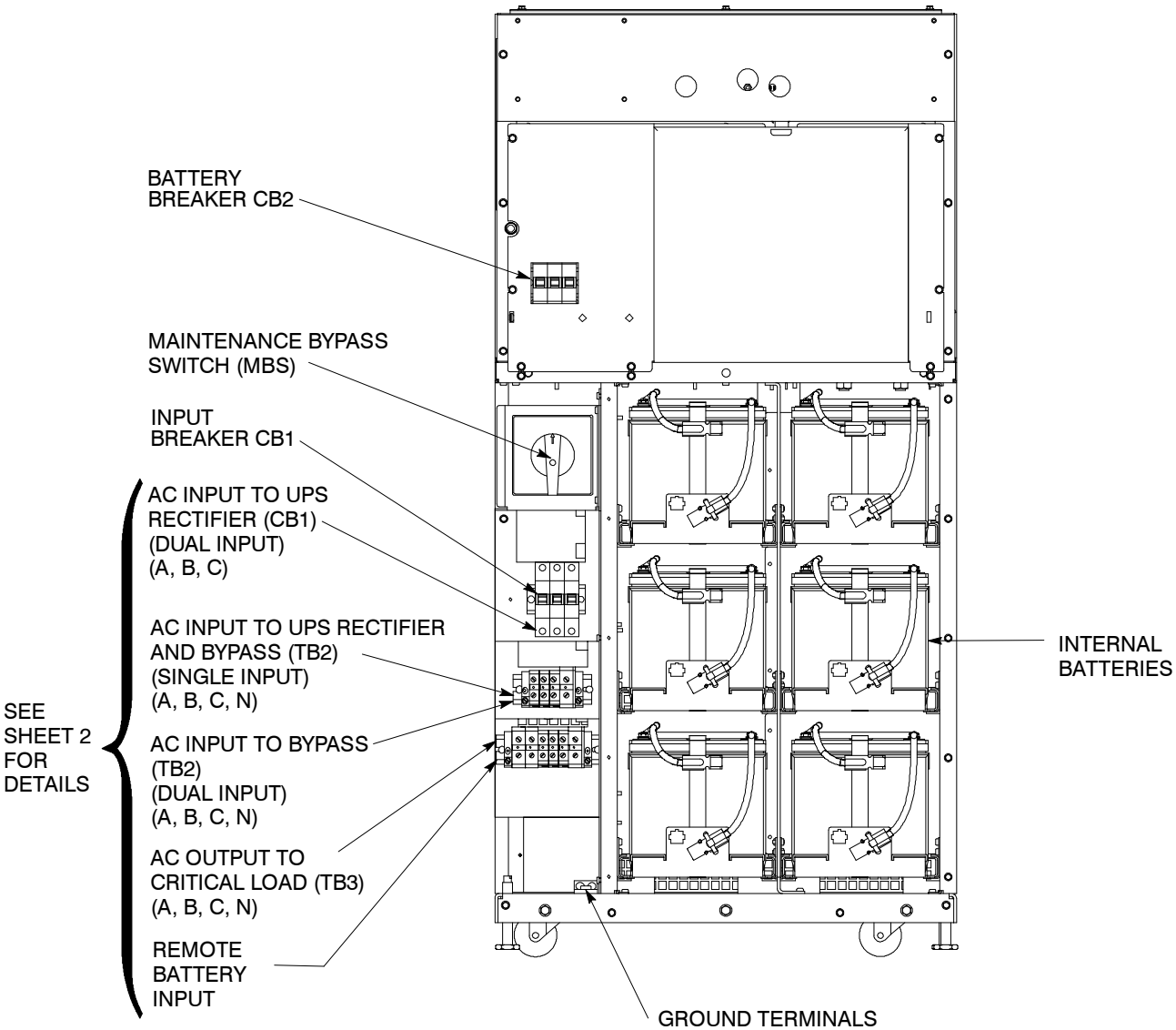
DUAL FEED; INPUT AND OUTPUT TRANSFORMERS;
BYPASS SWITCH; WITH DISTRIBUTION

CONFIGURATION 17

DUAL FEED; INPUT AND OUTPUT TRANSFORMERS;
BYPASS SWITCH; WITHOUT DISTRIBUTION

DESCRIPTION:	**OPTIONS CABINET SCHEMATICS**		
DRAWING NO:	164201300–7	*SHEET:*	10 of 10
REVISION:	F	*DATE:*	111501

UPS CABINET POWER TERMINALS

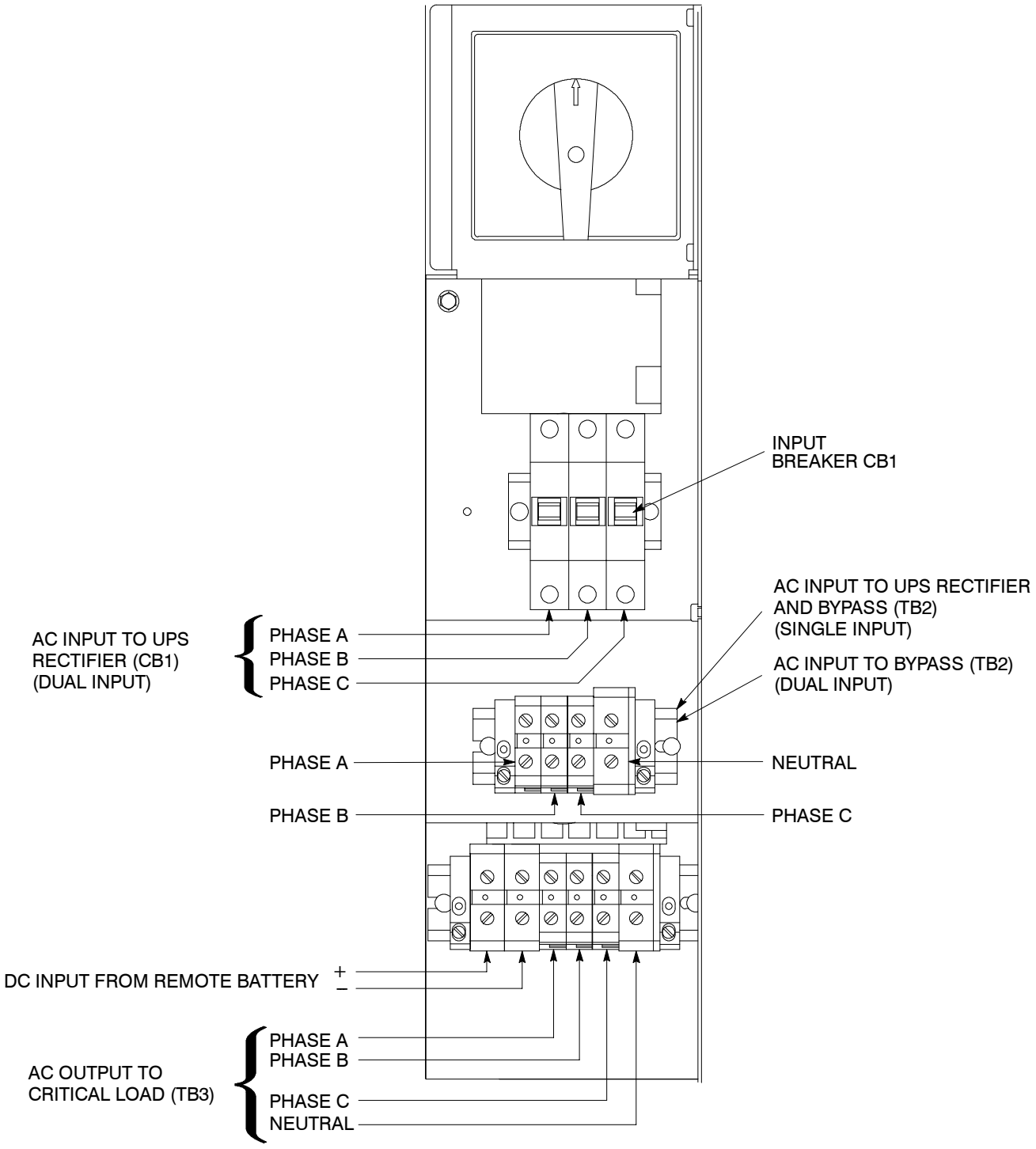


FRONT VIEW

NOTE: METAL SHIELD COVERING POWER WIRING TERMINALS AND BATTERY COMPARTMENT MUST BE REMOVED TO GAIN ACCESS TO WIRING TERMINALS.

DESCRIPTION:	**LOCATION OF UPS CABINET TERMINALS POWERWARE 9330 (10 kVA–20 kVA)**		
DRAWING NO:	164201300–8	*SHEET:*	1 of 5
REVISION:	F	*DATE:*	111501

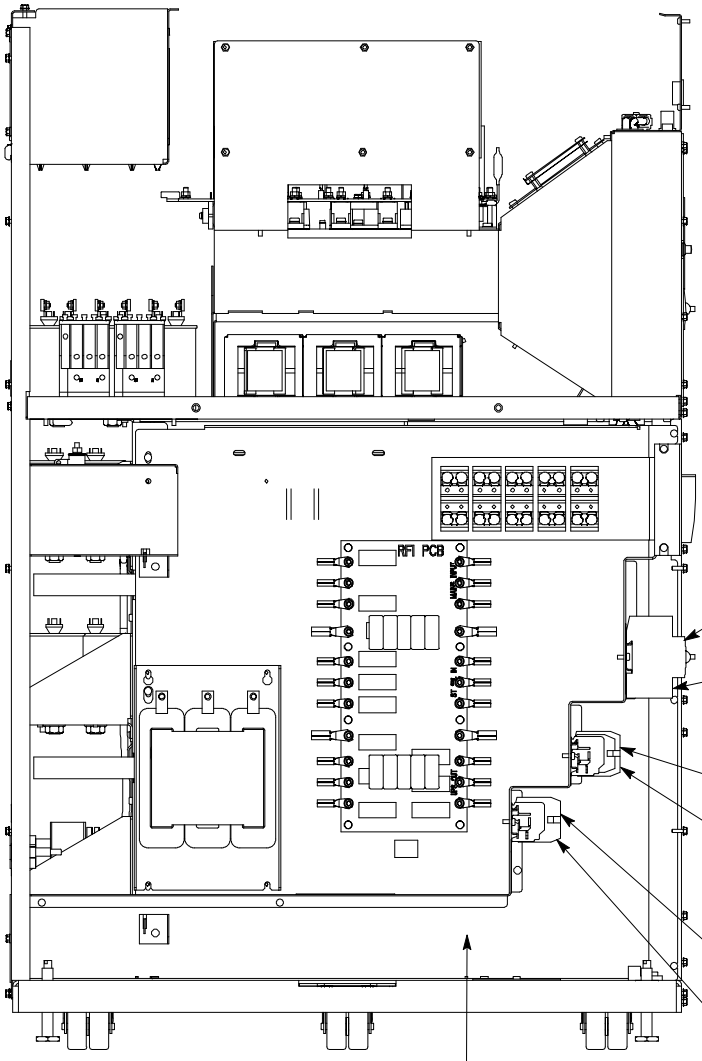
UPS CABINET POWER TERMINALS



FRONT VIEW DETAIL

DESCRIPTION:	**LOCATION OF UPS CABINET TERMINALS POWERWARE 9330 (10 kVA–20 kVA)**		
DRAWING NO:	164201300–8	*SHEET:*	2 of 5
REVISION:	F	*DATE:*	111501

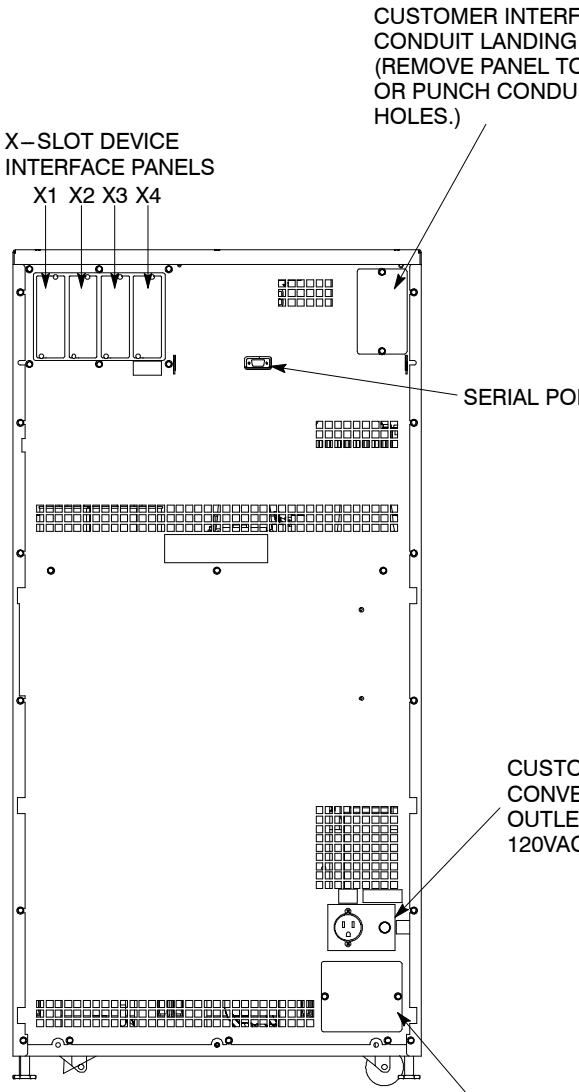
UPS CABINET POWER TERMINALS



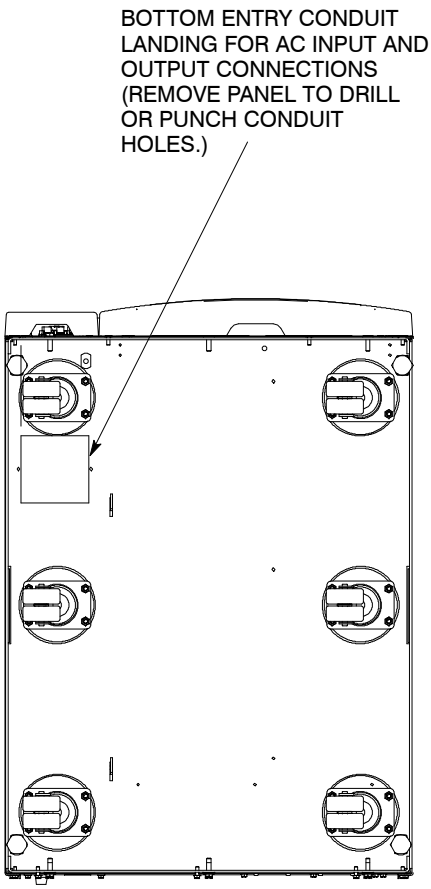
LEFT VIEW

DESCRIPTION:	**LOCATION OF UPS CABINET TERMINALS POWERWARE 9330 (10 kVA–20 kVA)**		
DRAWING NO:	164201300–8	*SHEET:*	3 of 5
REVISION:	F	*DATE:*	111501

UPS CABINET CUSTOMER INTERFACE TERMINALS


CUSTOMER INTERFACE CONDUIT LANDING PLATE (REMOVE PANEL TO DRILL OR PUNCH CONDUIT HOLES.)
X–SLOT DEVICE INTERFACE PANELS
X1 X2 X3 X4
SERIAL PORT
CUSTOMER CONVENIENCE OUTLET FOR MODEM 120VAC, 0.2 AMP
REAR ENTRY CONDUIT LANDING FOR AC INPUT AND OUTPUT AND REMOTE BATTERY CONNECTIONS (REMOVE PANEL TO DRILL OR PUNCH CONDUIT HOLES.)

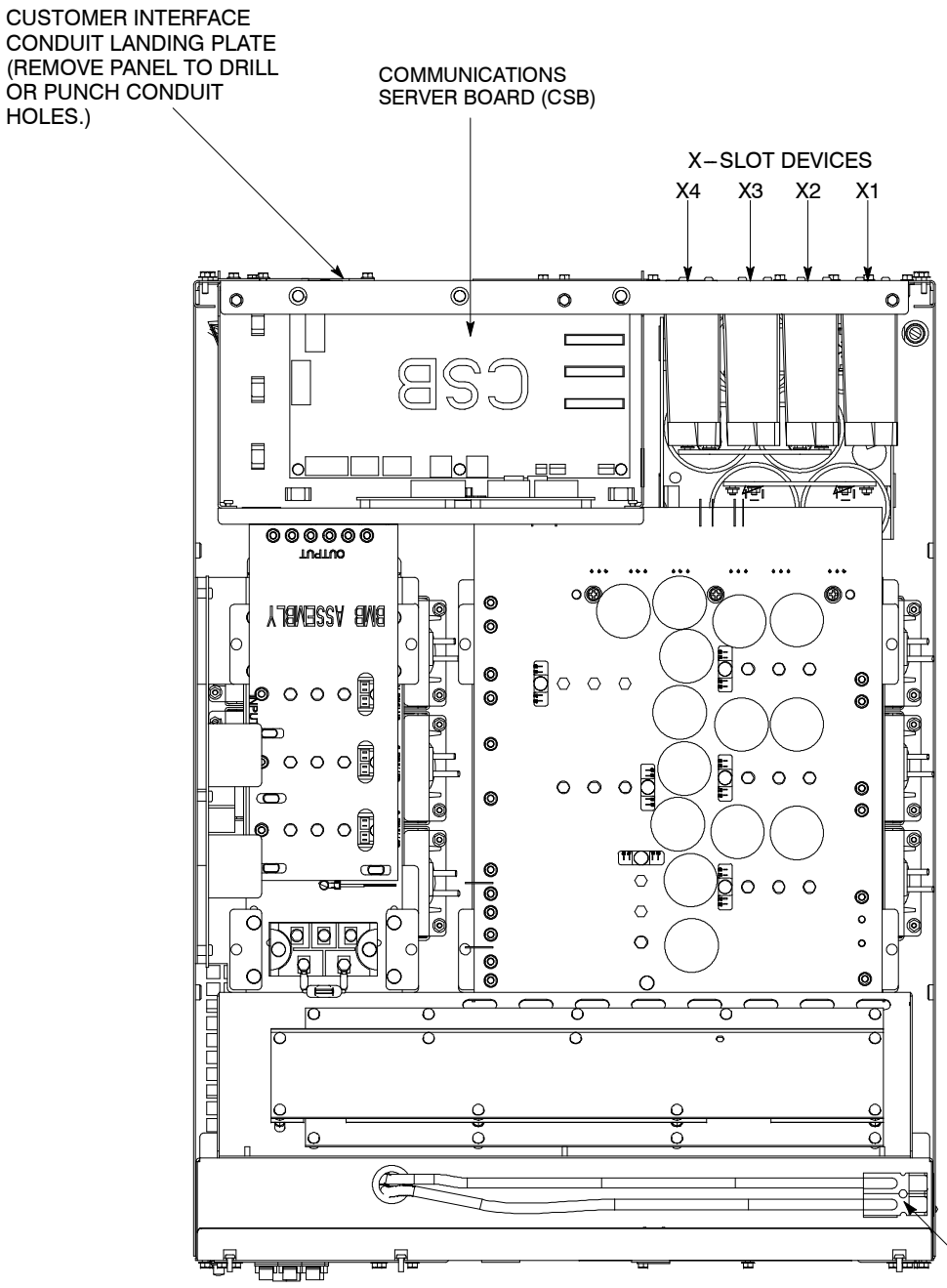
UPS
REAR VIEW



UPS
BOTTOM VIEW

DESCRIPTION:	**LOCATION OF UPS CABINET TERMINALS POWERWARE 9330 (10 kVA–20 kVA)**		
DRAWING NO:	164201300–8	*SHEET:*	4 of 5
REVISION:	F	*DATE:*	111501

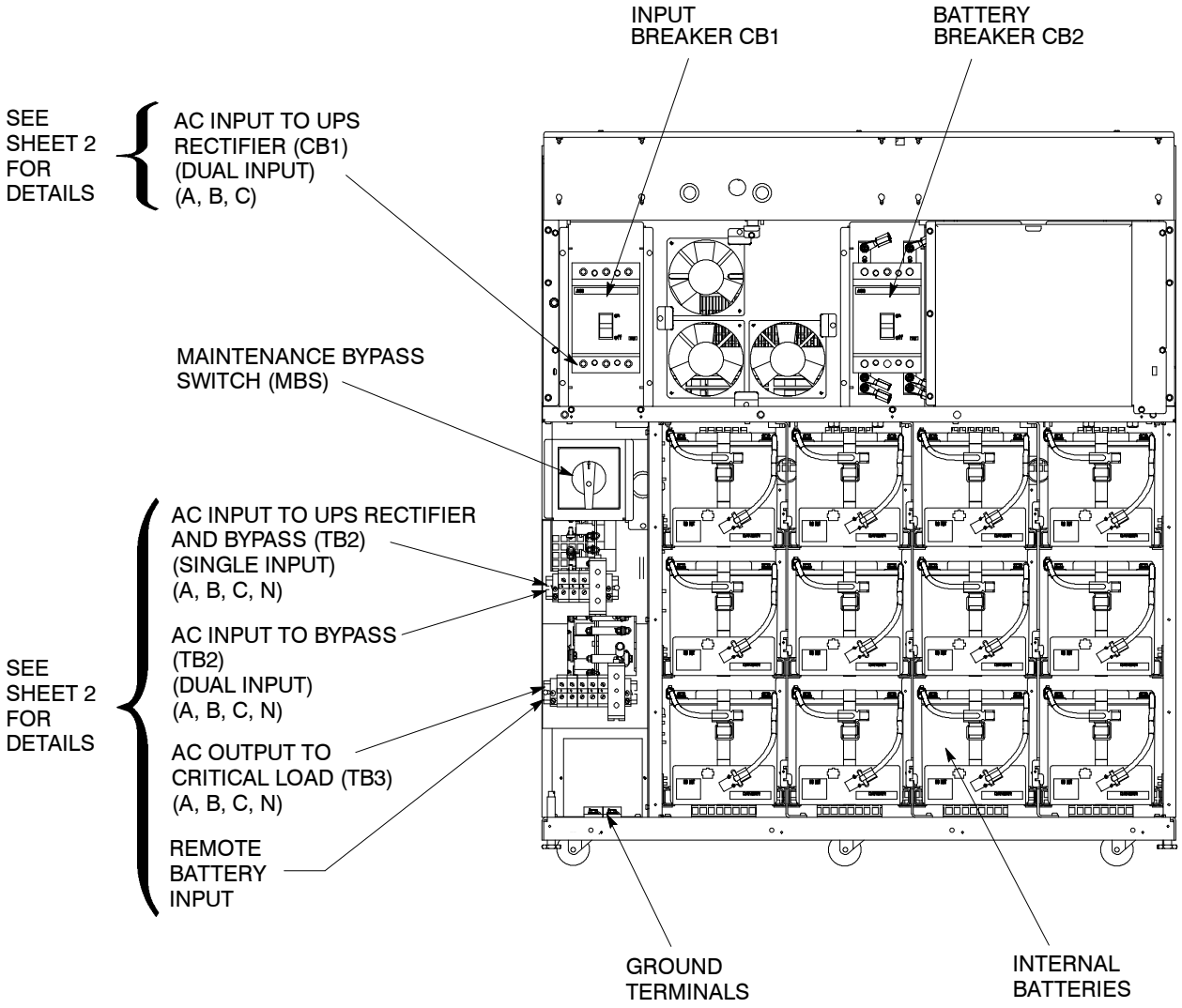
UPS CABINET CUSTOMER INTERFACE TERMINALS



TOP VIEW

DESCRIPTION: **LOCATION OF UPS CABINET TERMINALS POWERWARE 9330 (10 kVA–20 kVA)**			
DRAWING NO:	164201300–8	*SHEET:*	5 of 5
REVISION:	F	*DATE:*	111501

UPS CABINET POWER TERMINALS

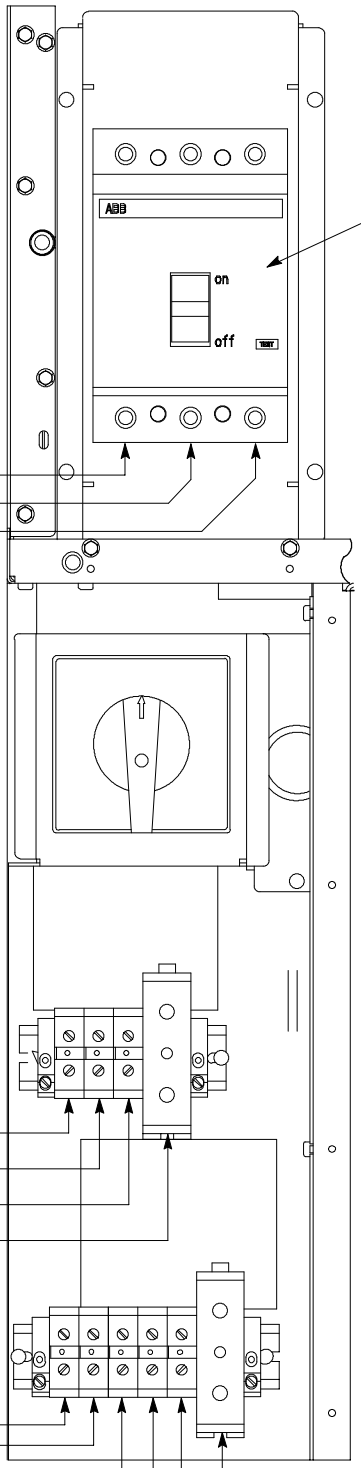

INPUT BREAKER CB1
BATTERY BREAKER CB2
SEE SHEET 2 FOR DETAILS
AC INPUT TO UPS RECTIFIER (CB1) (DUAL INPUT) (A, B, C)
MAINTENANCE BYPASS SWITCH (MBS)
SEE SHEET 2 FOR DETAILS
AC INPUT TO UPS RECTIFIER AND BYPASS (TB2) (SINGLE INPUT) (A, B, C, N)
AC INPUT TO BYPASS (TB2) (DUAL INPUT) (A, B, C, N)
AC OUTPUT TO CRITICAL LOAD (TB3) (A, B, C, N)
REMOTE BATTERY INPUT
GROUND TERMINALS
INTERNAL BATTERIES

FRONT VIEW

NOTE: METAL SHIELDS COVERING POWER WIRING TERMINALS, BATTERY COMPARTMENT, AND CB1 MUST BE REMOVED TO GAIN ACCESS TO WIRING TERMINALS.

DESCRIPTION:	**LOCATION OF UPS CABINET TERMINALS POWERWARE 9330 (25 kVA–40 kVA)**		
DRAWING NO:	164201300–9	*SHEET:*	1 of 6
REVISION:	D	*DATE:*	053001

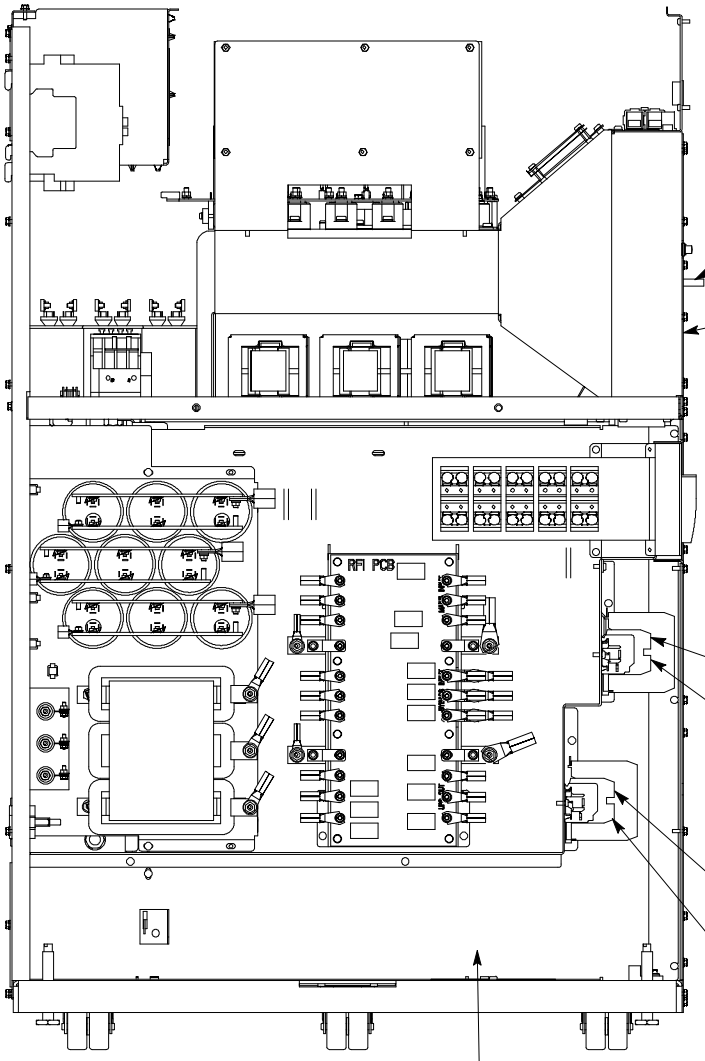
UPS CABINET POWER TERMINALS



FRONT VIEW DETAIL

DESCRIPTION:	**LOCATION OF UPS CABINET TERMINALS POWERWARE 9330 (25 kVA–40 kVA)**		
DRAWING NO:	164201300–9	*SHEET:*	2 of 6
REVISION:	D	*DATE:*	053001

UPS CABINET POWER TERMINALS



INPUT
BREAKER CB1

AC INPUT TO UPS
RECTIFIER (CB1)
(DUAL INPUT)
(A, B, C)

AC INPUT TO UPS RECTIFIER
AND BYPASS (TB2)
(SINGLE INPUT)
(A, B, C, N)

AC INPUT TO BYPASS
(TB2)
(DUAL INPUT)
(A, B, C, N)

AC OUTPUT TO
CRITICAL LOAD (TB3)
(A, B, C, N)

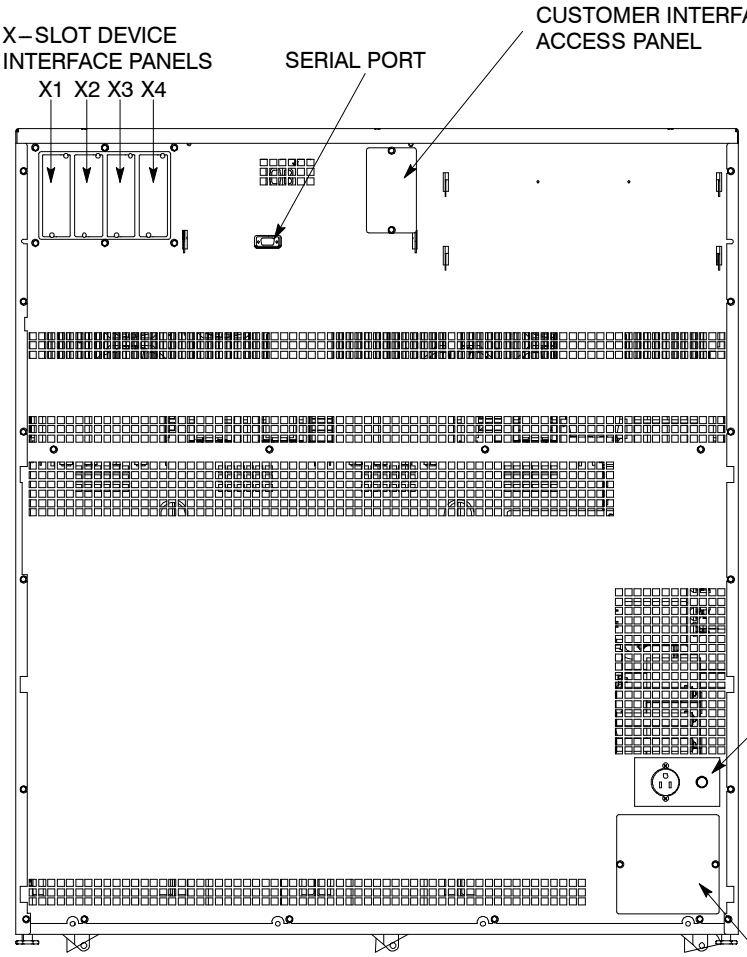
REMOTE
BATTERY
INPUT

POWER WIRING
WIREWAY

LEFT VIEW

DESCRIPTION:	**LOCATION OF UPS CABINET TERMINALS POWERWARE 9330 (25 kVA–40 kVA)**		
DRAWING NO:	164201300–9	*SHEET:*	3 of 6
REVISION:	D	*DATE:*	053001

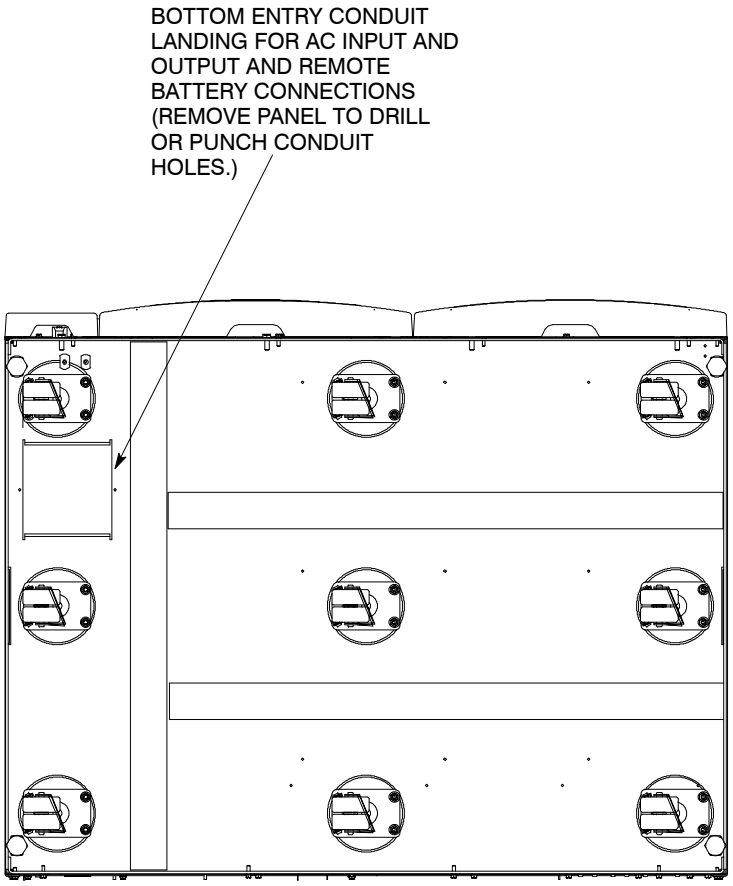
UPS CABINET CUSTOMER INTERFACE TERMINALS



UPS
REAR VIEW

DESCRIPTION: **LOCATION OF UPS CABINET TERMINALS POWERWARE 9330 (25 kVA–40 kVA)**	
DRAWING NO: 164201300–9	*SHEET:* 4 of 6
REVISION: D	*DATE:* 053001

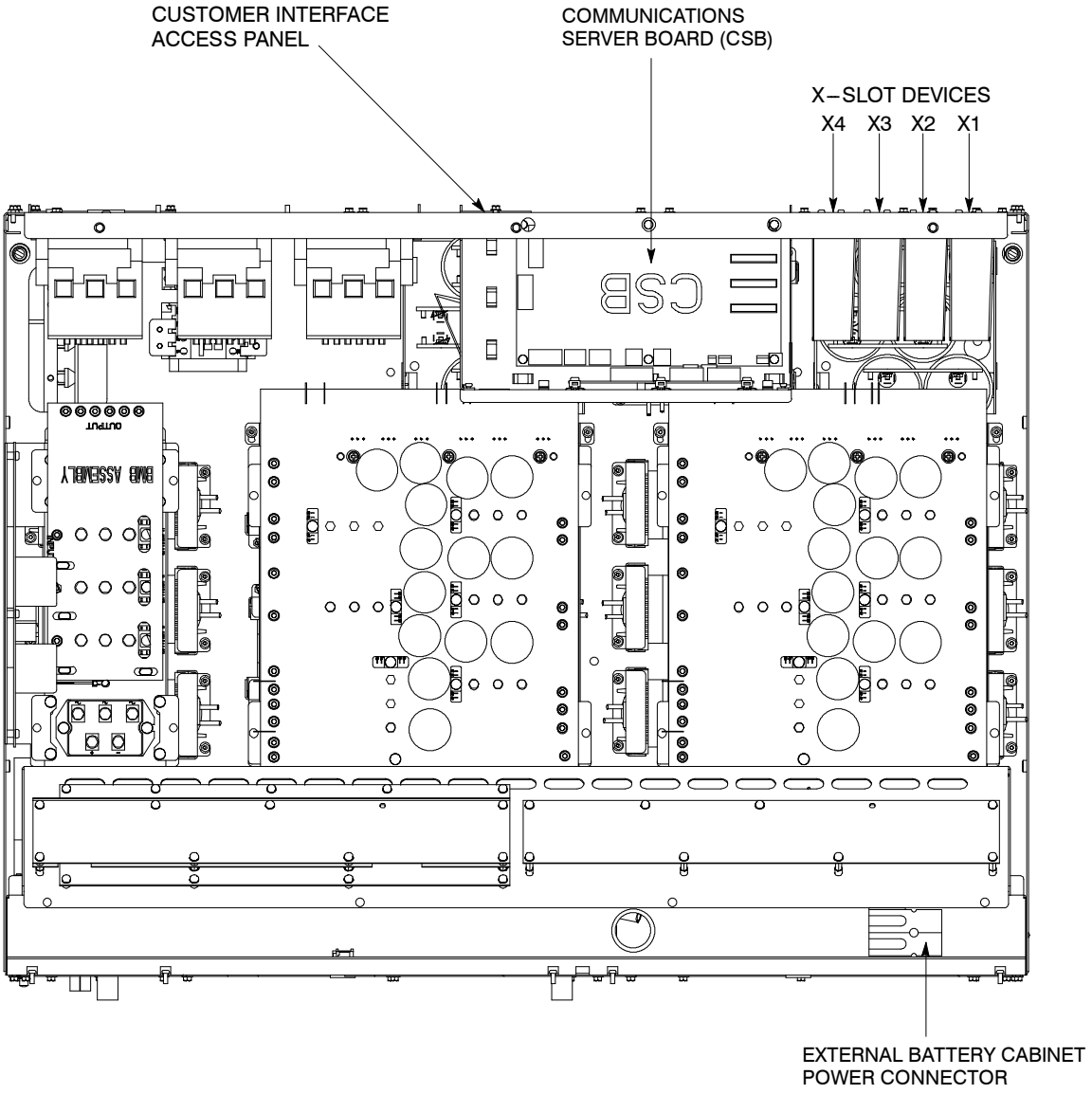
UPS CABINET CUSTOMER INTERFACE TERMINALS


BOTTOM ENTRY CONDUIT LANDING FOR AC INPUT AND OUTPUT AND REMOTE BATTERY CONNECTIONS (REMOVE PANEL TO DRILL OR PUNCH CONDUIT HOLES.)

UPS
BOTTOM VIEW

DESCRIPTION:	**LOCATION OF UPS CABINET TERMINALS POWERWARE 9330 (25 kVA–40 kVA)**
DRAWING NO: 164201300–9	*SHEET:* 5 of 6
REVISION: D	*DATE:* 053001

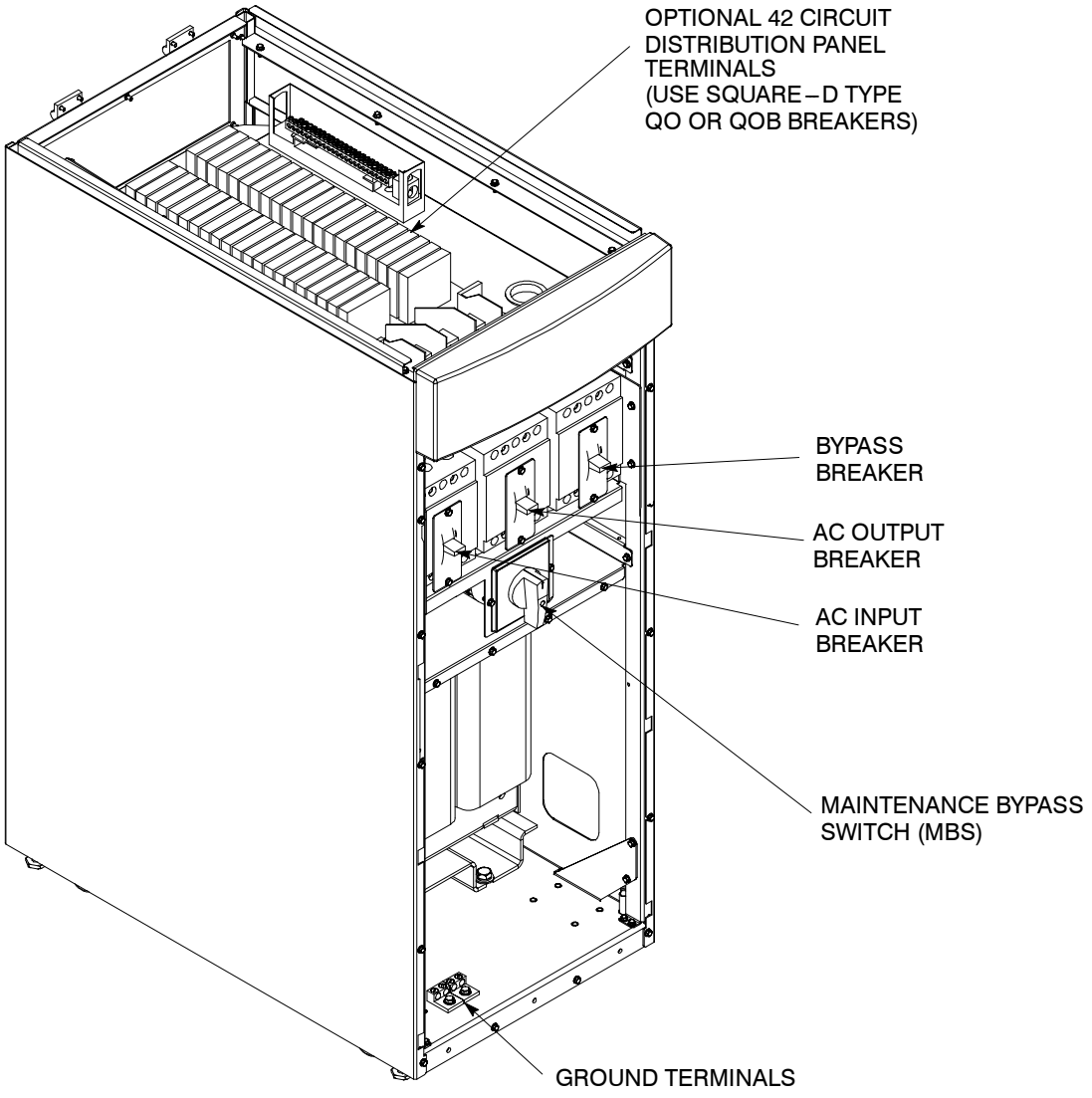
UPS CABINET CUSTOMER INTERFACE TERMINALS



UPS
TOP VIEW

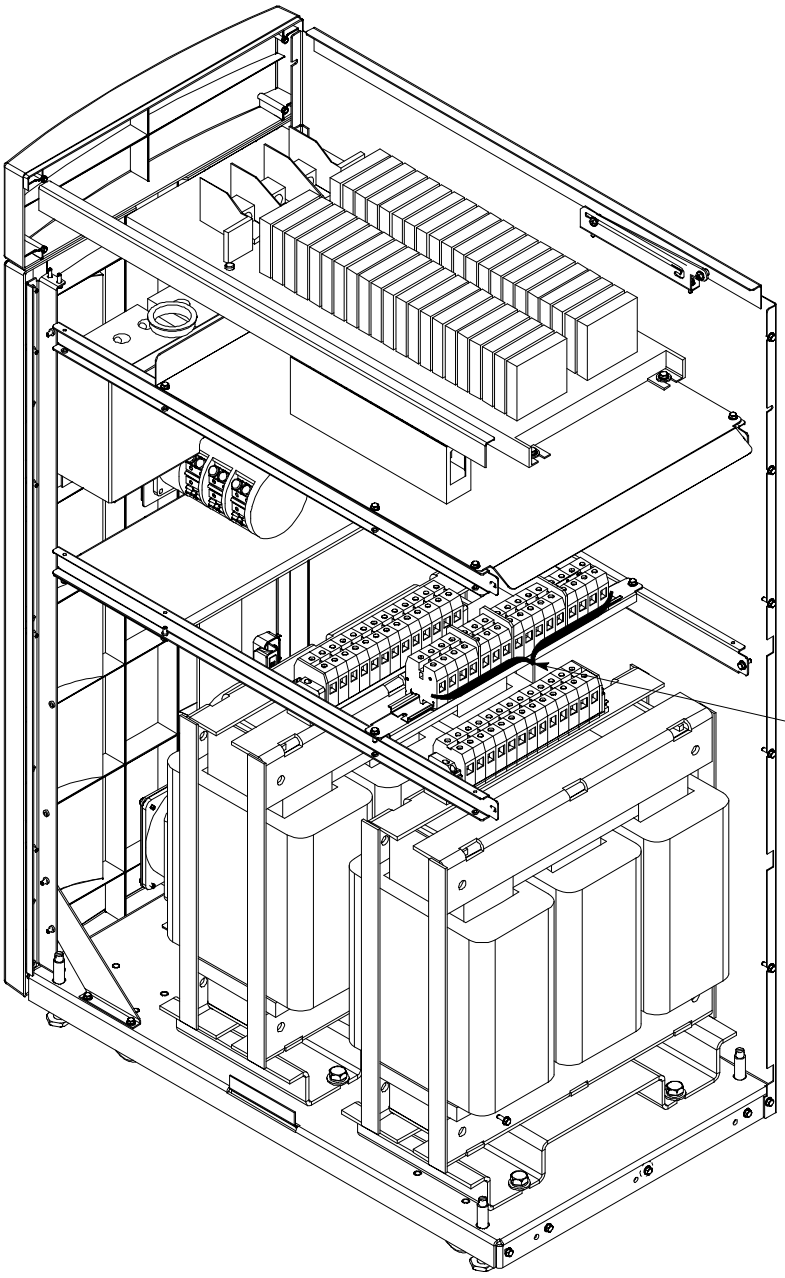
DESCRIPTION:	**LOCATION OF UPS CABINET TERMINALS POWERWARE 9330 (25 kVA–40 kVA)**		
DRAWING NO:	164201300–9	*SHEET:*	6 of 6
REVISION:	D	*DATE:*	053001

OPTIONS CABINET POWER TERMINALS


OPTIONAL 42 CIRCUIT DISTRIBUTION PANEL TERMINALS (USE SQUARE–D TYPE QO OR QOB BREAKERS)
BYPASS BREAKER
AC OUTPUT BREAKER
AC INPUT BREAKER
MAINTENANCE BYPASS SWITCH (MBS)
GROUND TERMINALS

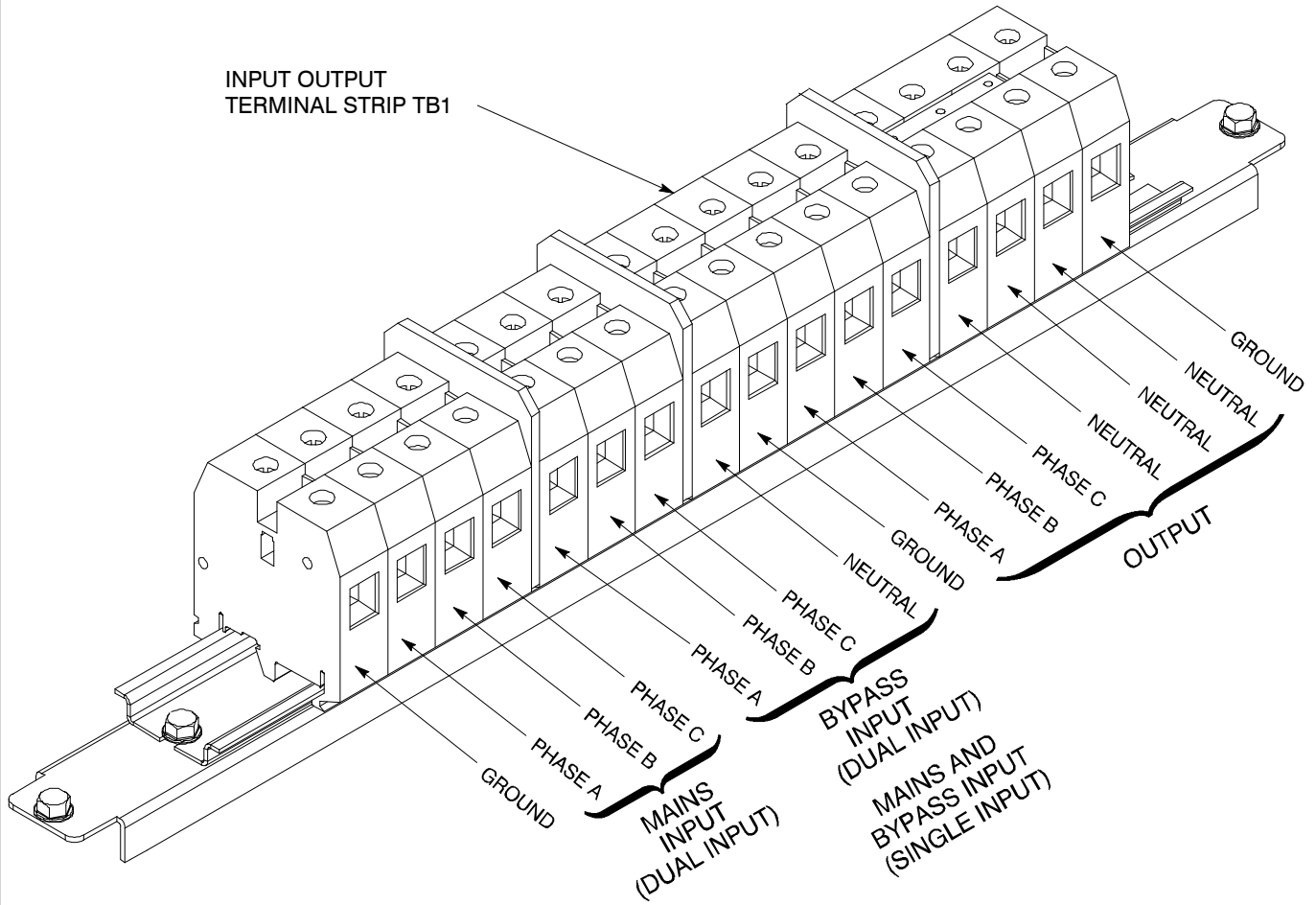
DESCRIPTION:	**LOCATION OF OPTIONS CABINET TERMINALS POWERWARE 9330 (10 kVA–20 kVA)**		
DRAWING NO:	164201300–10	*SHEET:*	1 of 4
REVISION:	D	*DATE:*	053001

OPTIONS CABINET POWER TERMINALS



DESCRIPTION:	**LOCATION OF OPTIONS CABINET TERMINALS POWERWARE 9330 (10 kVA–20 kVA)**		
DRAWING NO:	164201300–10	*SHEET:*	2 of 4
REVISION:	G	*DATE:*	061502

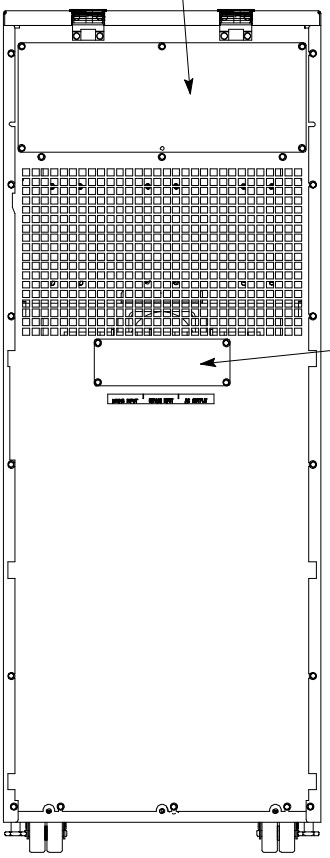
OPTIONS CABINET POWER TERMINALS



DESCRIPTION:	**LOCATION OF OPTIONS CABINET TERMINALS POWERWARE 9330 (10 kVA–20 kVA)**		
DRAWING NO:	164201300–10	*SHEET:*	3 of 4
REVISION:	D	*DATE:*	053001

OPTIONS CABINET POWER TERMINALS

CONDUIT ENTRY AREA FOR
OUTPUT FROM OPTIONAL
DISTRIBUTION PANEL
(REMOVE PANEL TO DRILL OR
PUNCH CONDUIT HOLES.)

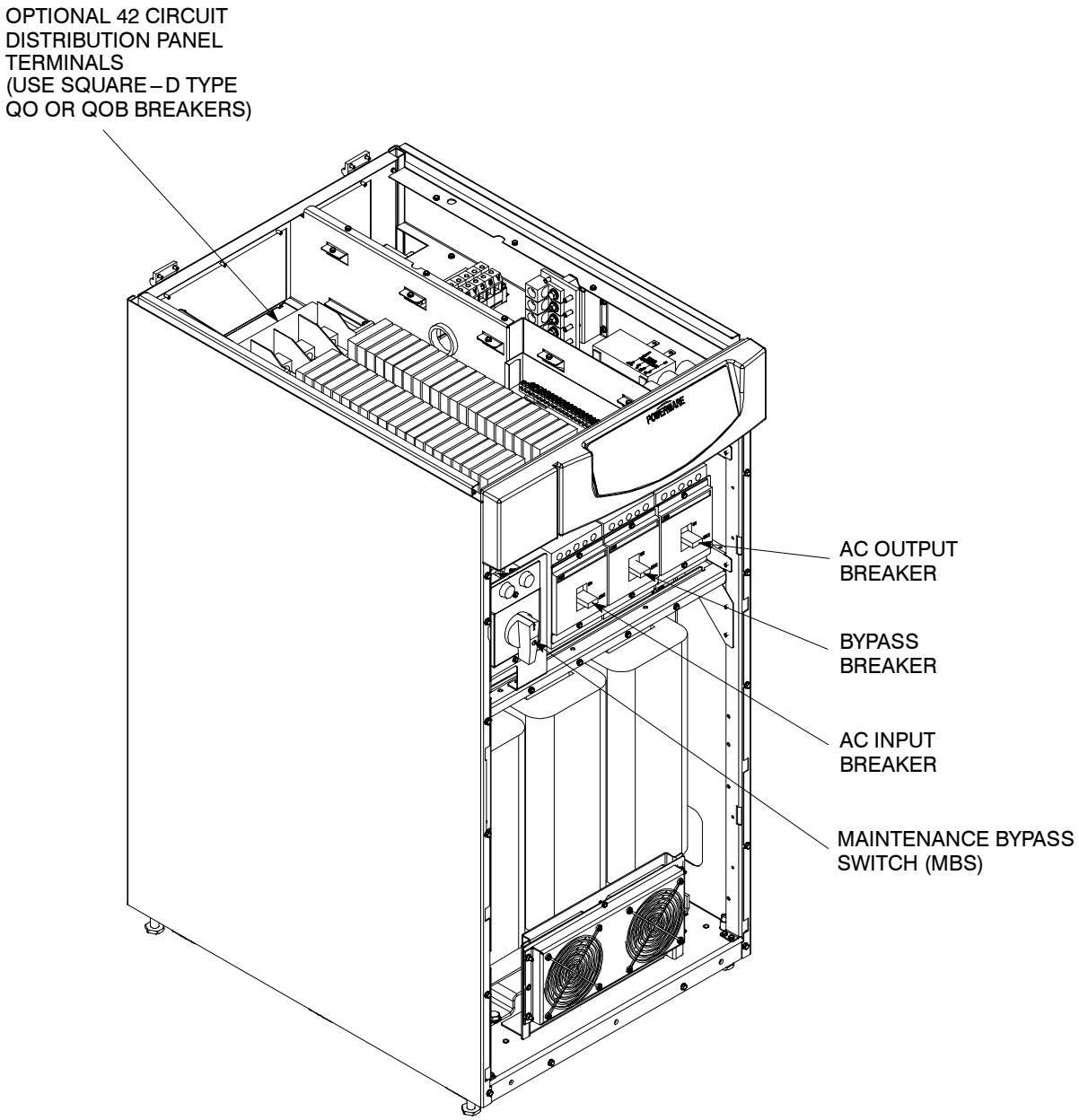


REAR ENTRY CONDUIT
LANDING FOR AC INPUT AND
OUTPUT CONNECTIONS
(REMOVE PANEL TO DRILL
OR PUNCH CONDUIT
HOLES.)

I/O
REAR VIEW

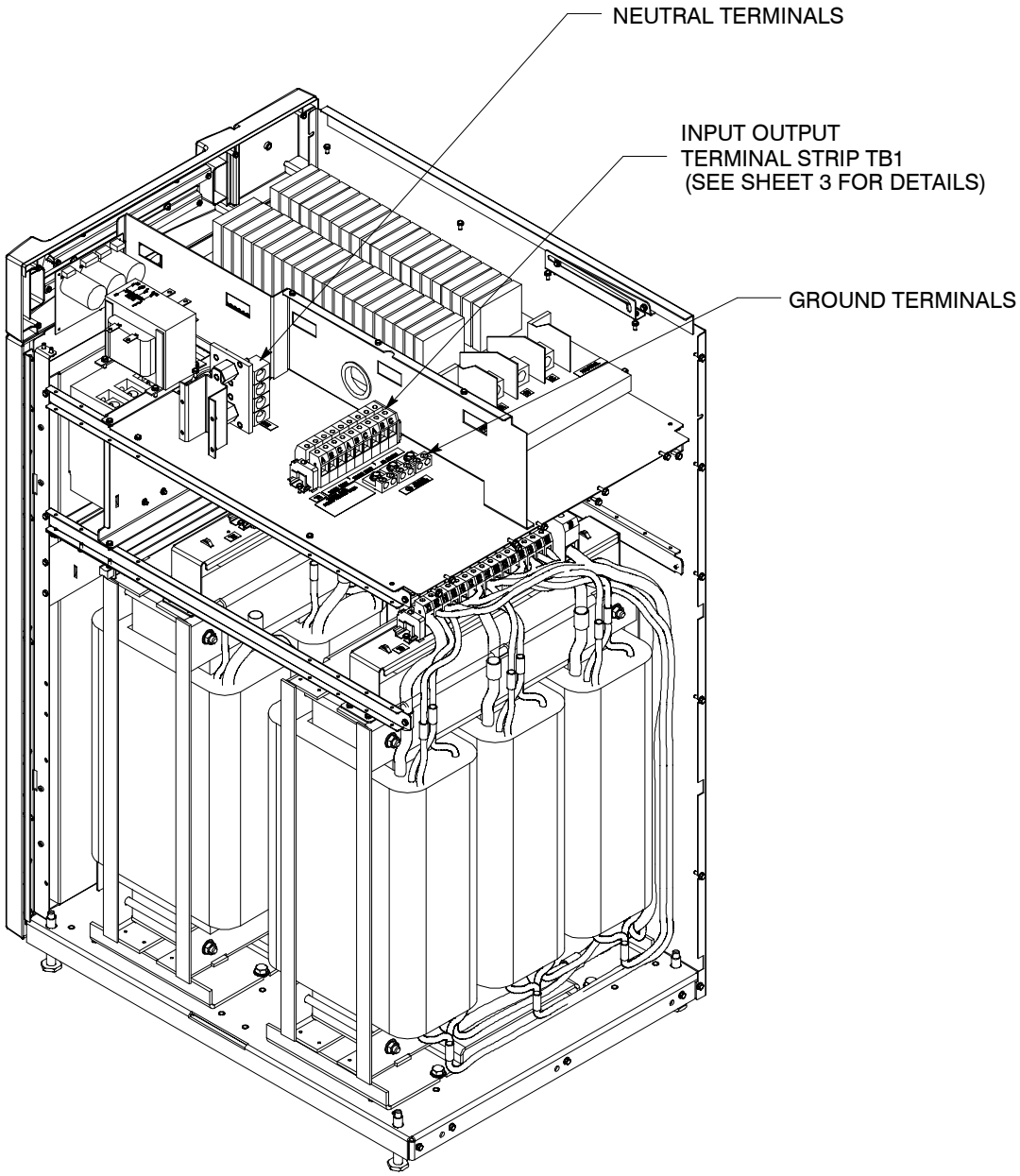
DESCRIPTION:	**LOCATION OF OPTIONS CABINET TERMNALS POWERWARE 9330 (10 kVA–20 kVA)**		
DRAWING NO:	164201300–10	*SHEET:*	4 of 4
REVISION:	D	*DATE:*	053001

OPTIONS CABINET POWER TERMINALS



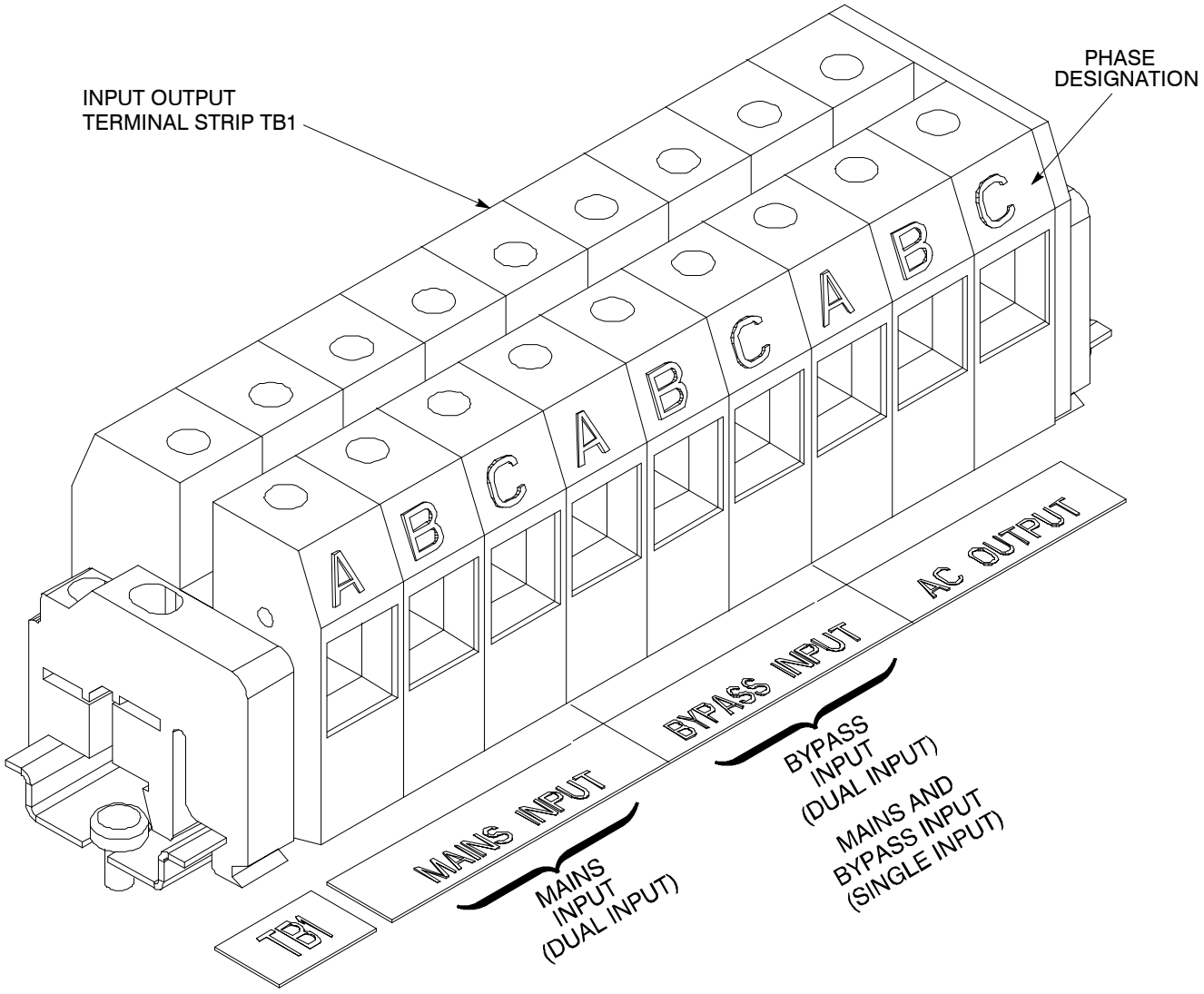
DESCRIPTION:	**LOCATION OF OPTIONS CABINET TERMINALS POWERWARE 9330 (25 kVA – 40 kVA)**		
DRAWING NO:	164201300 – 11	*SHEET:*	1 of 4
REVISION:	D	*DATE:*	053001

OPTIONS CABINET POWER TERMINALS



DESCRIPTION:	**LOCATION OF OPTIONS CABINET TERMINALS POWERWARE 9330 (25 kVA–40 kVA)**		
DRAWING NO:	164201300–11	*SHEET:*	2 of 4
REVISION:	G	*DATE:*	061502

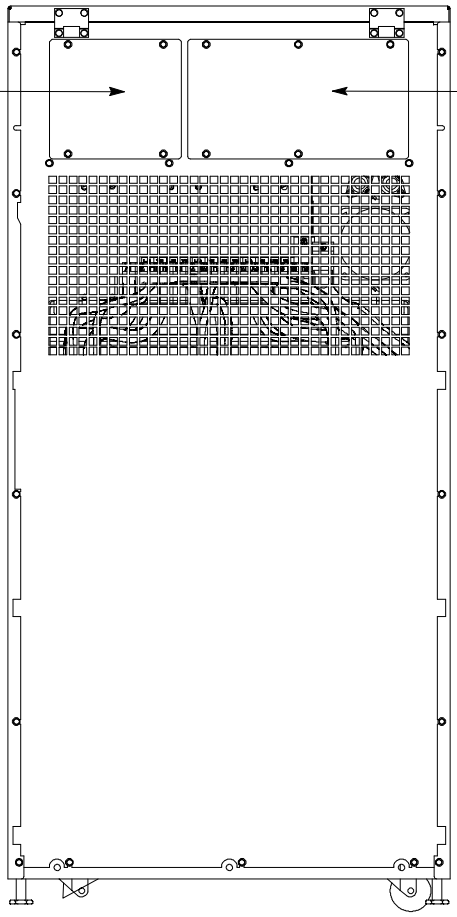
OPTIONS CABINET POWER TERMINALS



DESCRIPTION:	**LOCATION OF OPTIONS CABINET TERMNALS POWERWARE 9330 (25 kVA–40 kVA)**		
DRAWING NO:	164201300–11	*SHEET:*	3 of 4
REVISION:	D	*DATE:*	053001

OPTIONS CABINET POWER TERMINALS

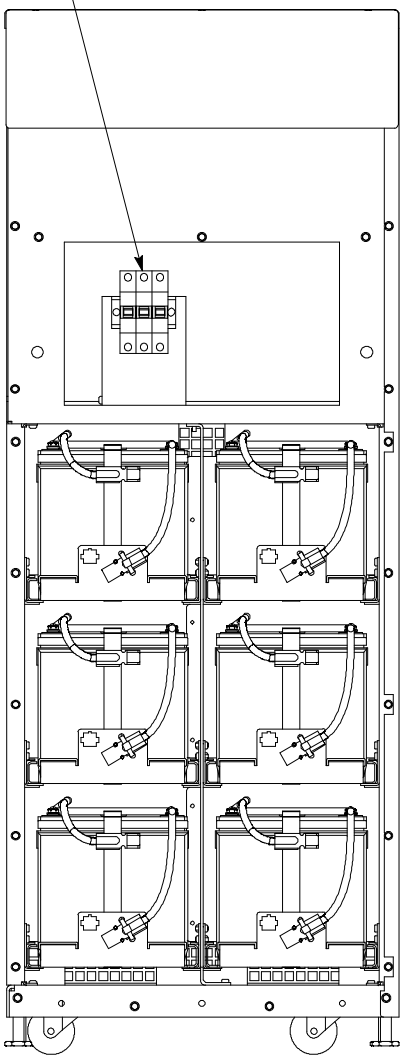
CONDUIT ENTRY AREA FOR AC INPUT AND OUTPUT CONNECTIONS (REMOVE PANEL TO DRILL OR PUNCH CONDUIT HOLES.)



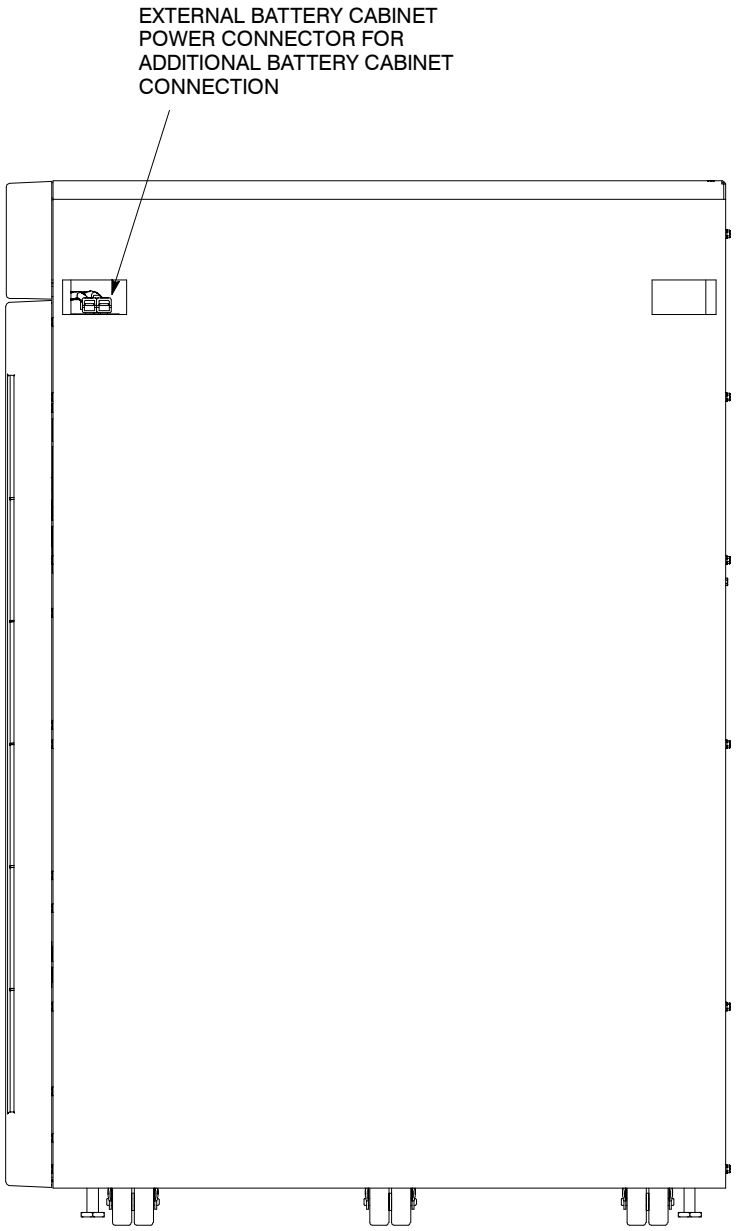
CONDUIT ENTRY AREA FOR OUTPUT FROM OPTIONAL DISTRIBUTION PANEL (REMOVE PANEL TO DRILL OR PUNCH CONDUIT HOLES.)

DESCRIPTION:	**LOCATION OF OPTIONS CABINET TERMINALS POWERWARE 9330 (25 kVA–40 kVA)**		
DRAWING NO:	164201300–11	*SHEET:*	4 of 4
REVISION:	D	*DATE:*	053001

BATTERY CABINET TERMINALS



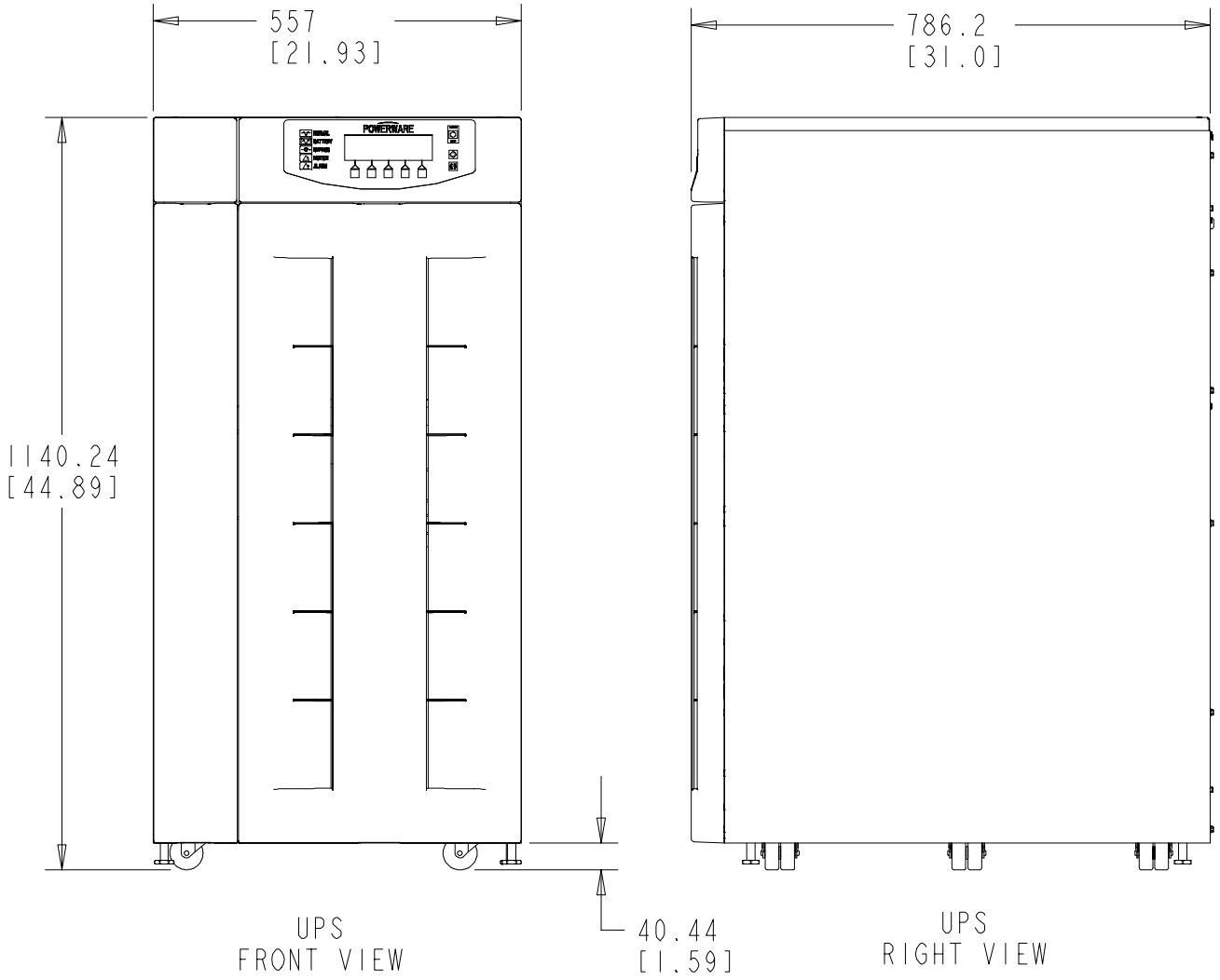
BATTERY CABINET
FRONT VIEW



BATTERY CABINET
RIGHT VIEW

DESCRIPTION:	**LOCATION OF BATTERY CABINET TERMINALS POWERWARE 9330 (10 kVA–20 kVA) POWERWARE 9330 (25 kVA–40 kVA)**		
DRAWING NO:	164201300–12	*SHEET:*	1 of 1
REVISION:	F	*DATE:*	111501

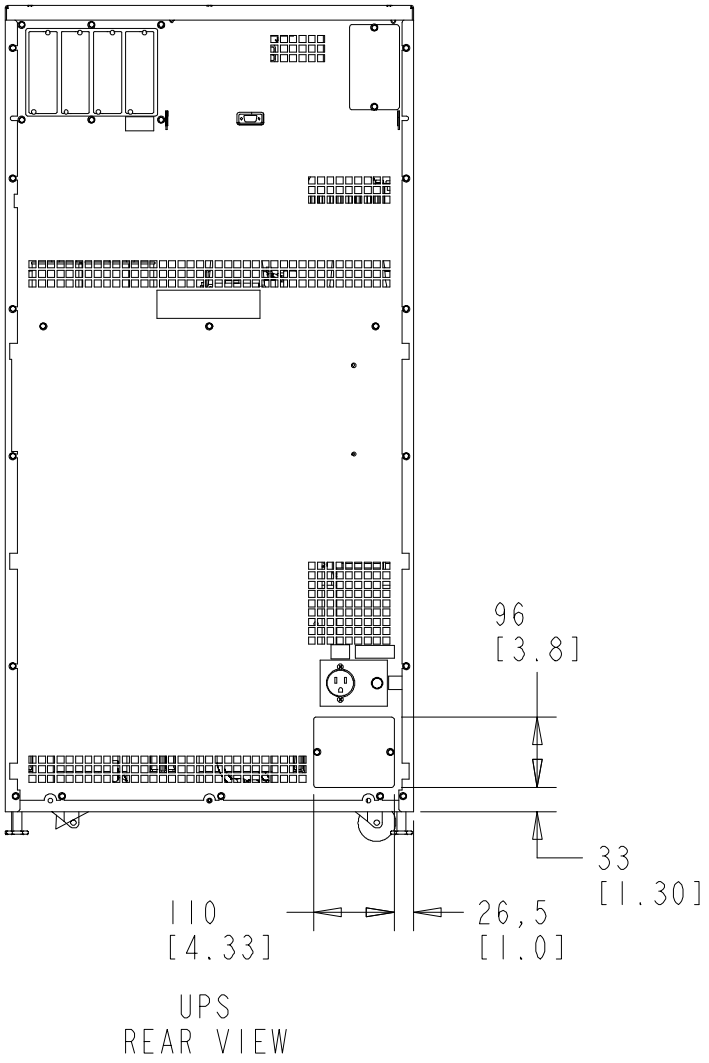
UPS CABINET

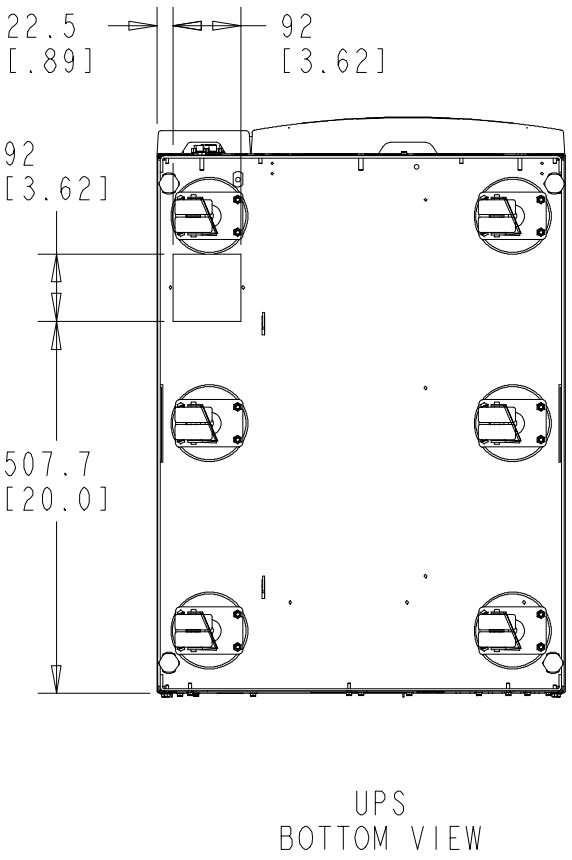


DESCRIPTION:	**UPS CABINET DIMENSIONS POWERWARE 9330 (10 kVA–20 kVA)**		
DRAWING NO:	164201300–13	*SHEET:*	1 of 2
REVISION: D		*DATE:* 053001	

Dimensions are in millimeters and [inches]

UPS CABINET

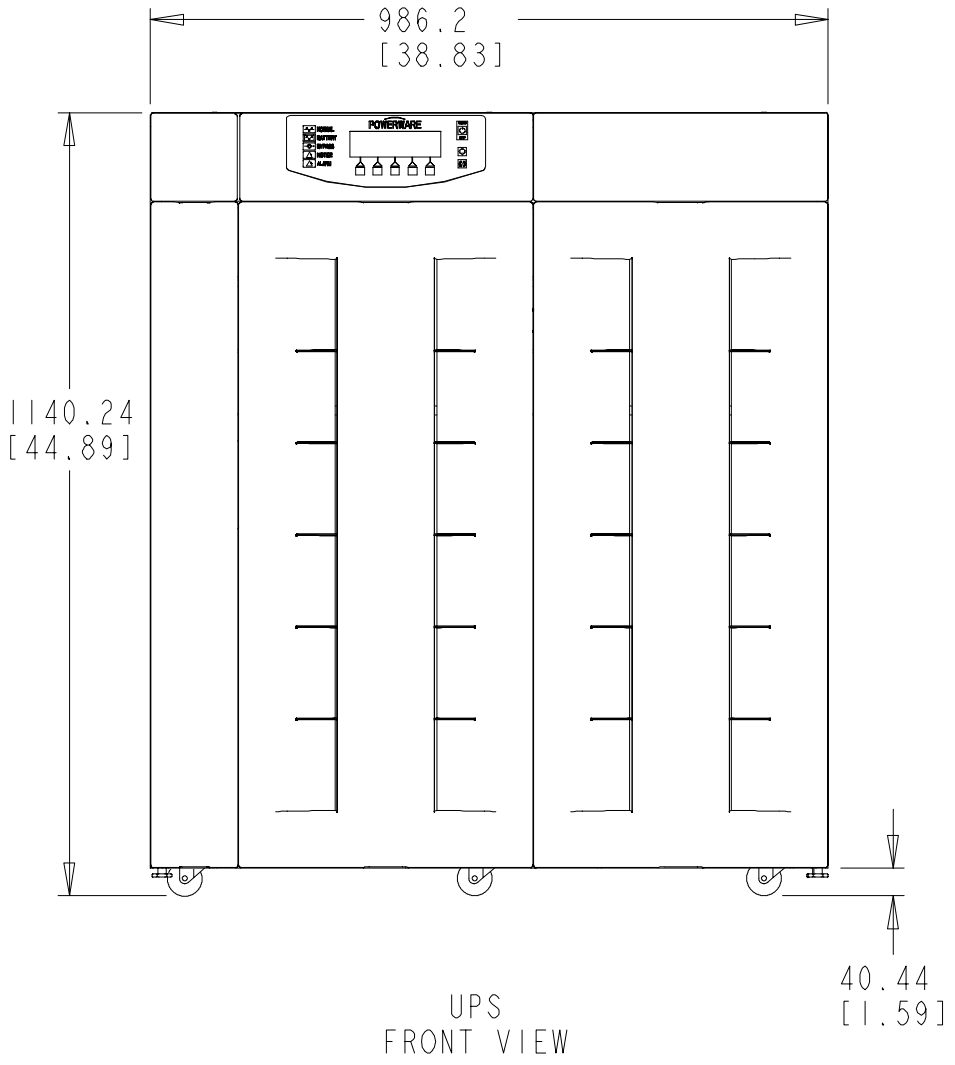




Dimensions are in millimeters and [inches]

DESCRIPTION:	**UPS CABINET DIMENSIONS POWERWARE 9330 (10 kVA–20 kVA)**		
DRAWING NO:	164201300–13	*SHEET:*	2 of 2
REVISION:	F	*DATE:*	111501

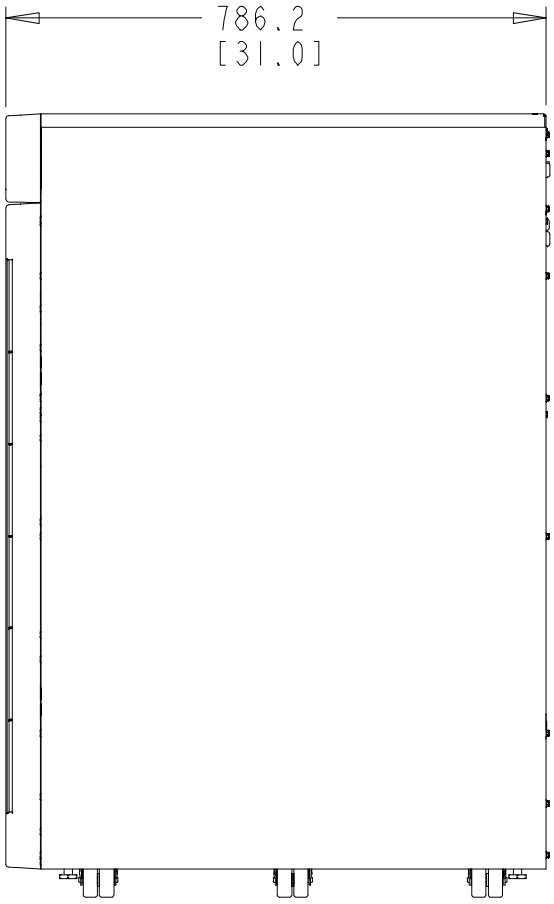
UPS CABINET



DESCRIPTION:	**UPS CABINET DIMENSIONS POWERWARE 9330 (25 kVA–40 kVA)**		
DRAWING NO:	164201300–14	*SHEET:*	1 of 4
REVISION: D		*DATE:* 053001	

Dimensions are in millimeters and [inches]

UPS CABINET

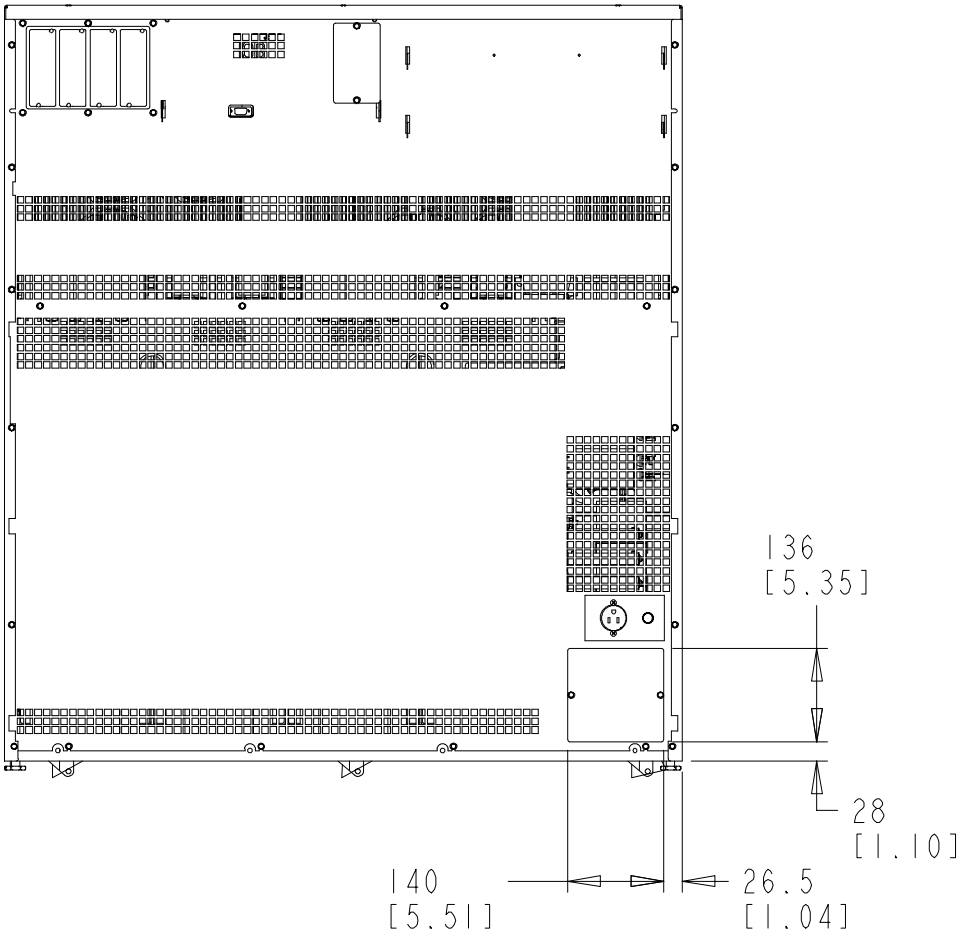


UPS
RIGHT VIEW

DESCRIPTION:	**UPS CABINET DIMENSIONS POWERWARE 9330 (25 kVA–40 kVA)**		
DRAWING NO:	164201300–14	*SHEET:*	2 of 4
REVISION: D		*DATE:*	053001

Dimensions are in millimeters and [inches]

UPS CABINET

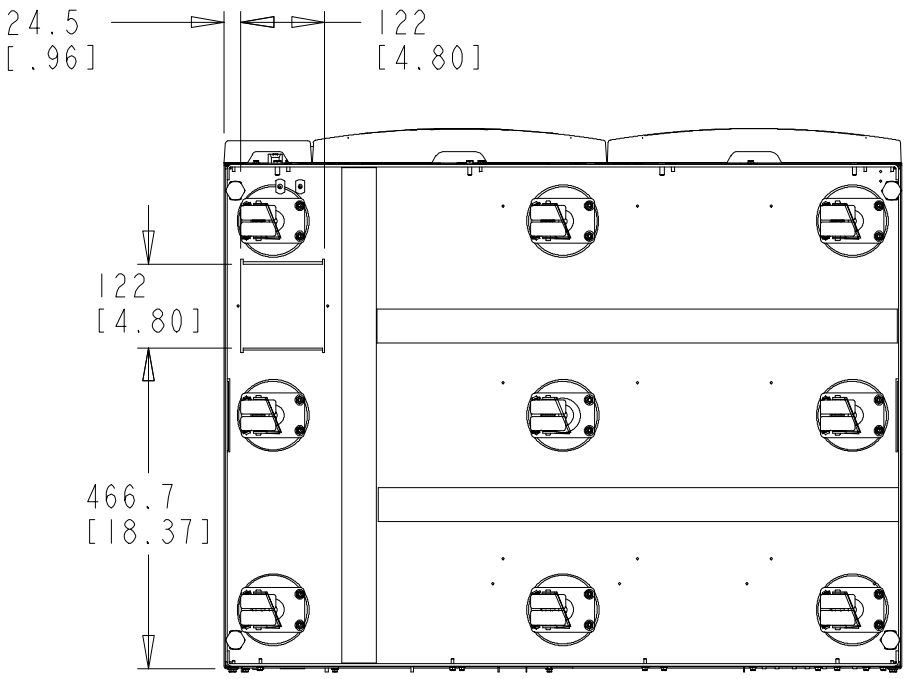


UPS
REAR VIEW

Dimensions are in millimeters and [inches]

DESCRIPTION:	**UPS CABINET DIMENSIONS POWERWARE 9330 (25 kVA–40 kVA)**		
DRAWING NO:	164201300–14	*SHEET:*	3 of 4
REVISION: D		*DATE:*	053001

UPS CABINET

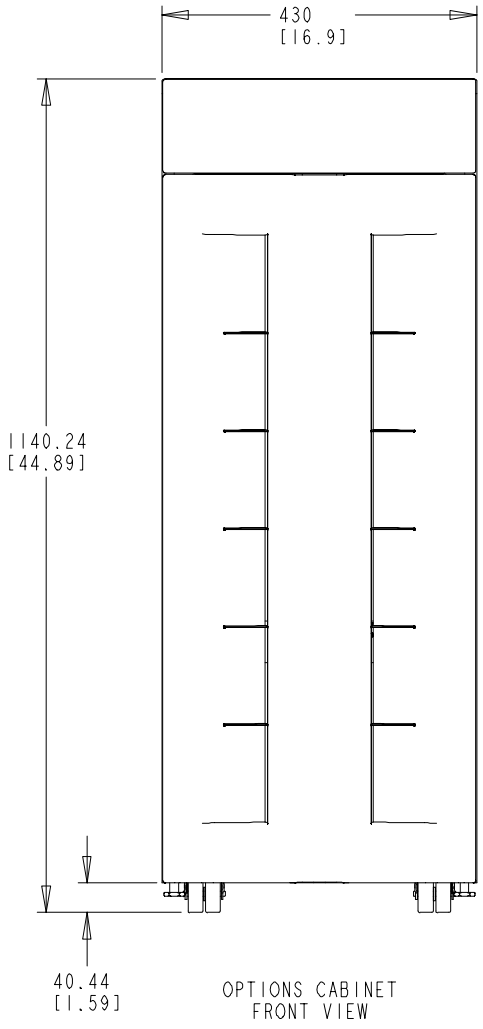


UPS
BOTTOM VIEW

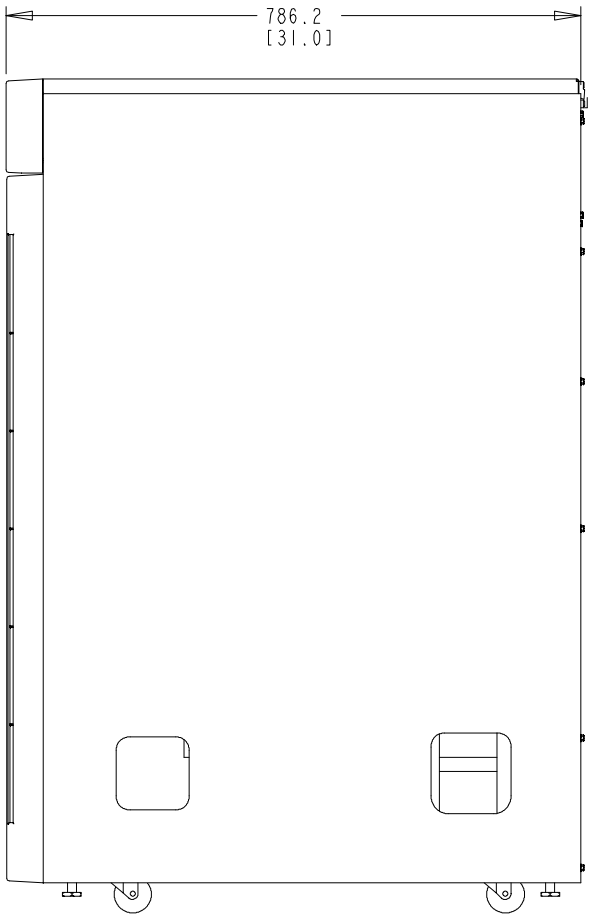
Dimensions are in millimeters and [inches]

DESCRIPTION:	**UPS CABINET DIMENSIONS POWERWARE 9330 (25 kVA–40 kVA)**		
DRAWING NO:	164201300–14	*SHEET:*	4 of 4
REVISION: E		*DATE:*	071501

OPTIONS CABINET



OPTIONS CABINET
FRONT VIEW

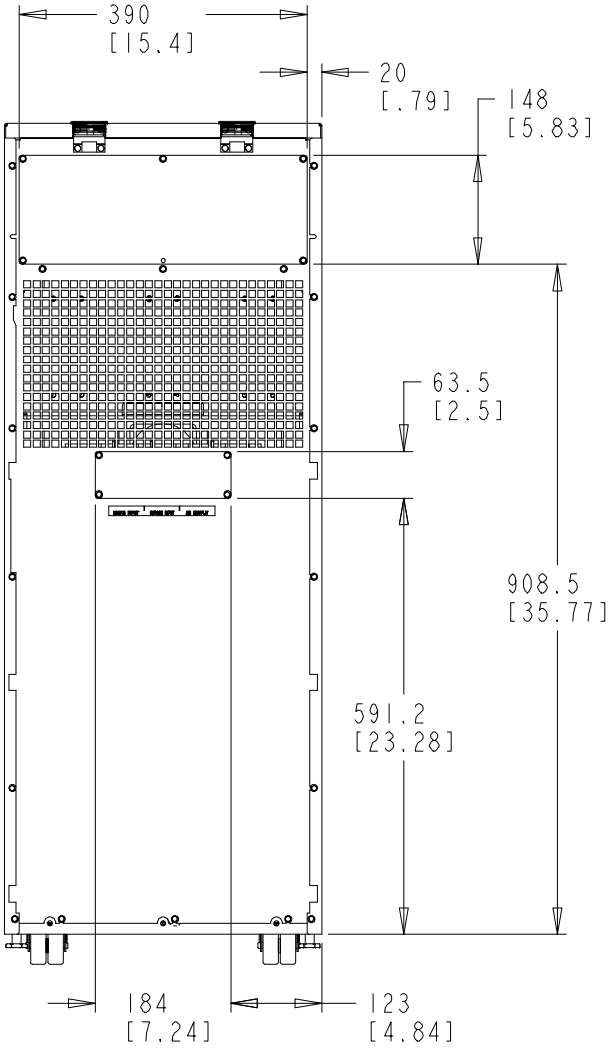


OPTIONS CABINET
RIGHT VIEW

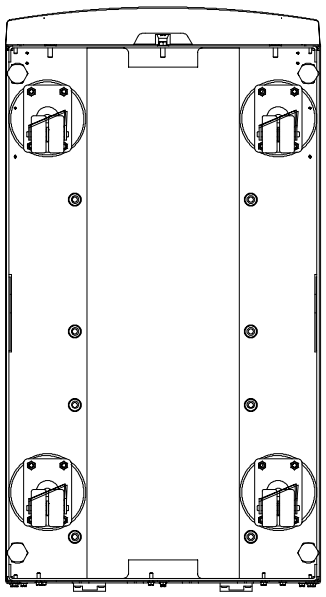
Dimensions are in millimeters and [inches]

DESCRIPTION:	**OPTIONS CABINET DIMENSIONS POWERWARE 9330 (10 kVA–20 kVA)**		
DRAWING NO:	164201300–15	*SHEET:*	1 of 2
REVISION:	D	*DATE:*	053001

OPTIONS CABINET



OPTIONS CABINET
REAR VIEW

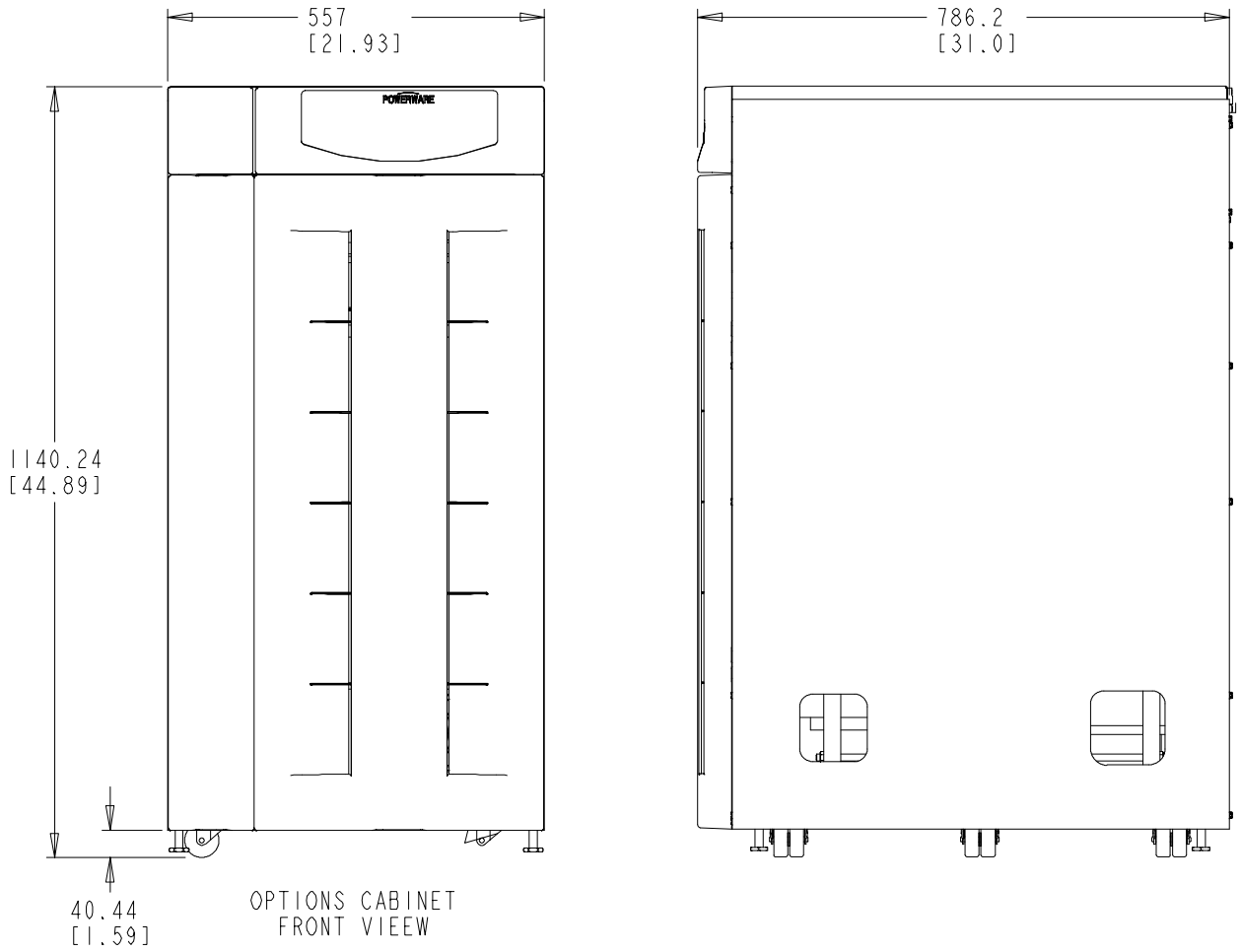


OPTIONS CABINET
BOTTOM VIEW

Dimensions are in millimeters and [inches]

DESCRIPTION:	**OPTIONS CABINET DIMENSIONS POWERWARE 9330 (10 kVA–20 kVA)**		
DRAWING NO:	164201300–15	*SHEET:*	2 of 2
REVISION: D		*DATE:* 053001	

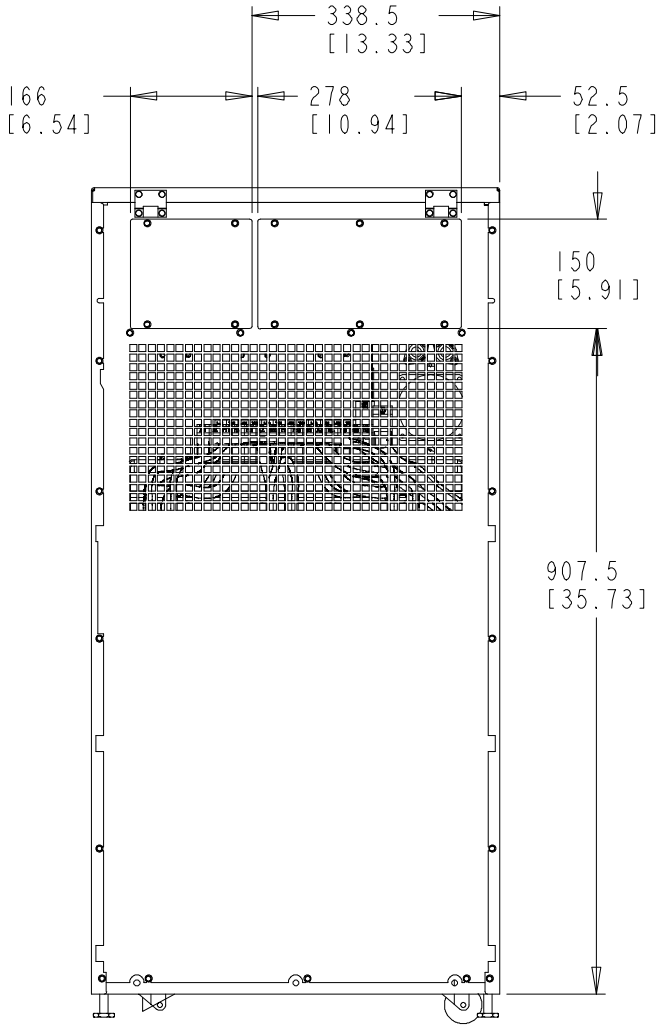
OPTIONS CABINET

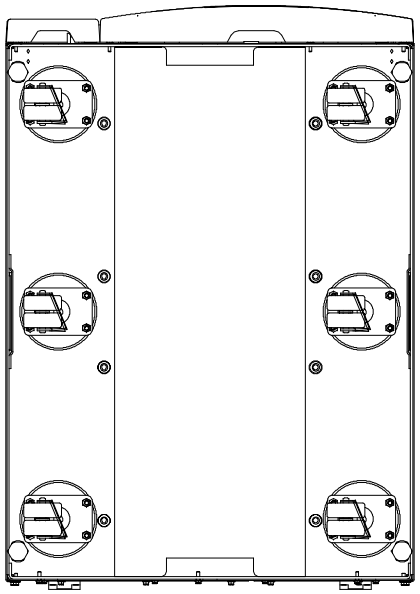


Dimensions are in millimeters and [inches]

DESCRIPTION:	**OPTIONS CABINET DIMENSIONS POWERWARE 9330 (25 kVA–40 kVA)**		
DRAWING NO:	164201300–16	*SHEET:*	1 of 2
REVISION:	D	*DATE:*	053001

OPTIONS CABINET

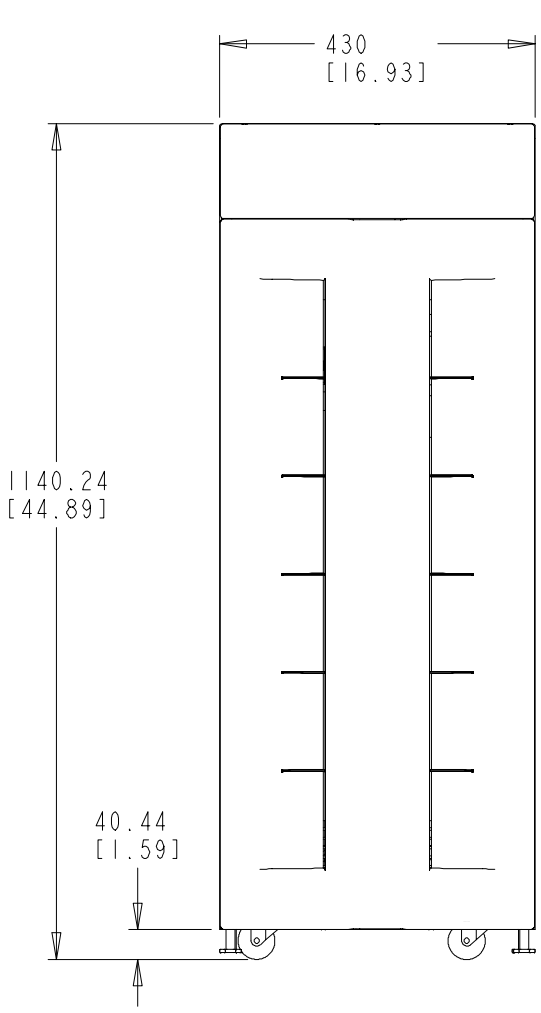




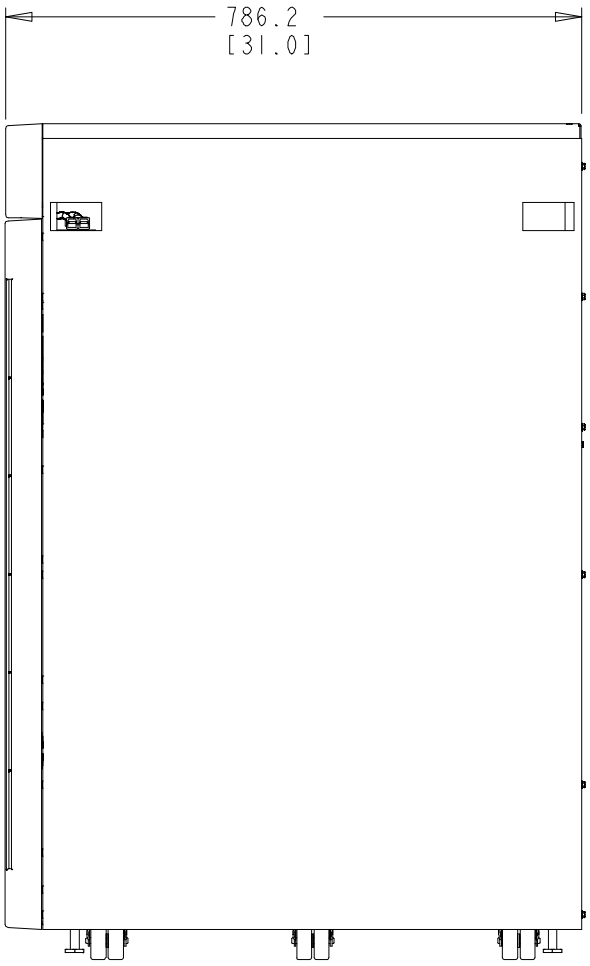
Dimensions are in millimeters and [inches]

DESCRIPTION:	**OPTIONS CABINET DIMENSIONS POWERWARE 9330 (25 kVA–40 kVA)**		
DRAWING NO:	164201300–16	*SHEET:*	2 of 2
REVISION:	D	*DATE:*	053001

BATTERY CABINET



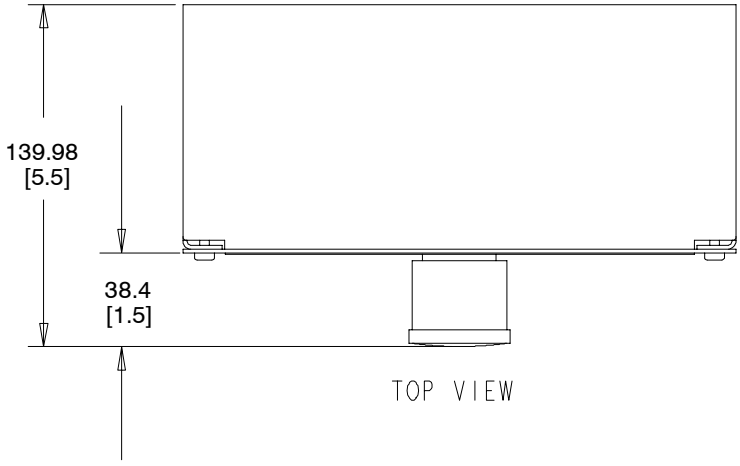
BATTERY CABINET
FRONT VIEW



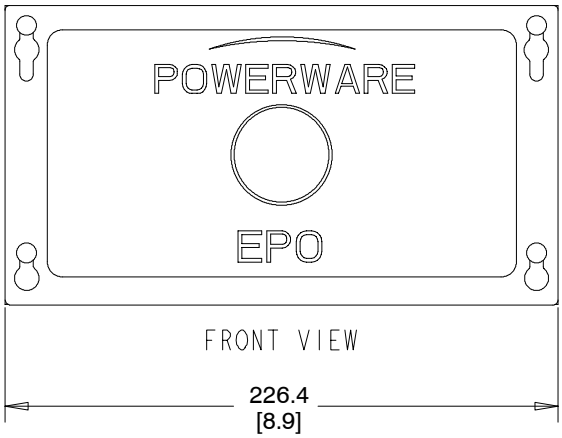
BATTERY CABINET
RIGHT VIEW

Dimensions are in millimeters and [inches]

DESCRIPTION:	**BATTERY CABINET DIMENSIONS POWERWARE 9330 (10 kVA–20 kVA) POWERWARE 9330 (25 kVA–40 kVA)**		
DRAWING NO:	164201300–17	*SHEET:*	1 of 1
REVISION:	D	*DATE:*	053001

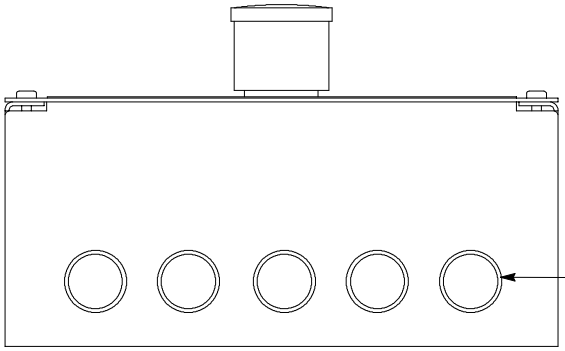


TOP VIEW



FRONT VIEW

226.4
[8.9]

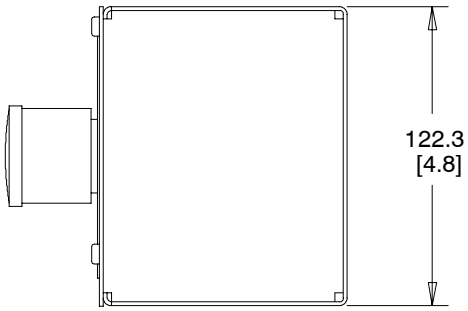


KNOCKOUTS
FOR
1/2" CONDUIT
(5 PLACES)

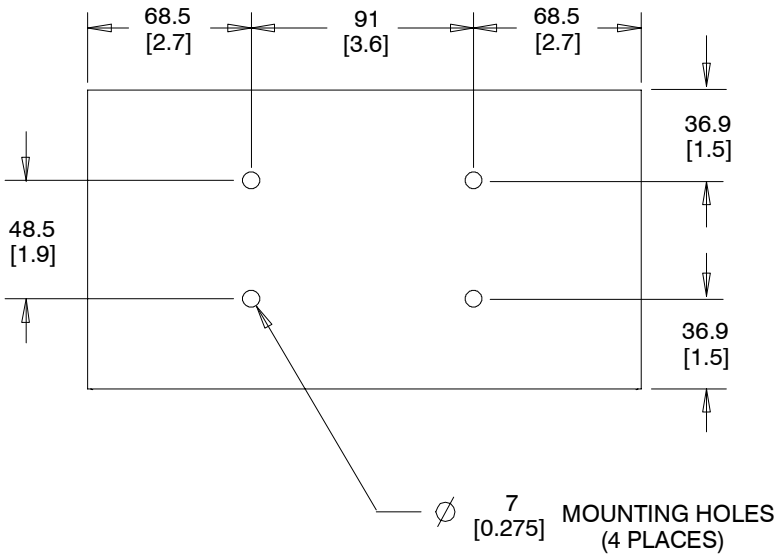
BOTTOM VIEW

DESCRIPTION:	**TYPICAL REMOTE EMERGENCY POWER OFF**		
DRAWING NO:	164201300–18	*SHEET:*	1 of 2
REVISION:	G	*DATE:*	051502

Dimensions are in millimeters and [inches]



RIGHT VIEW

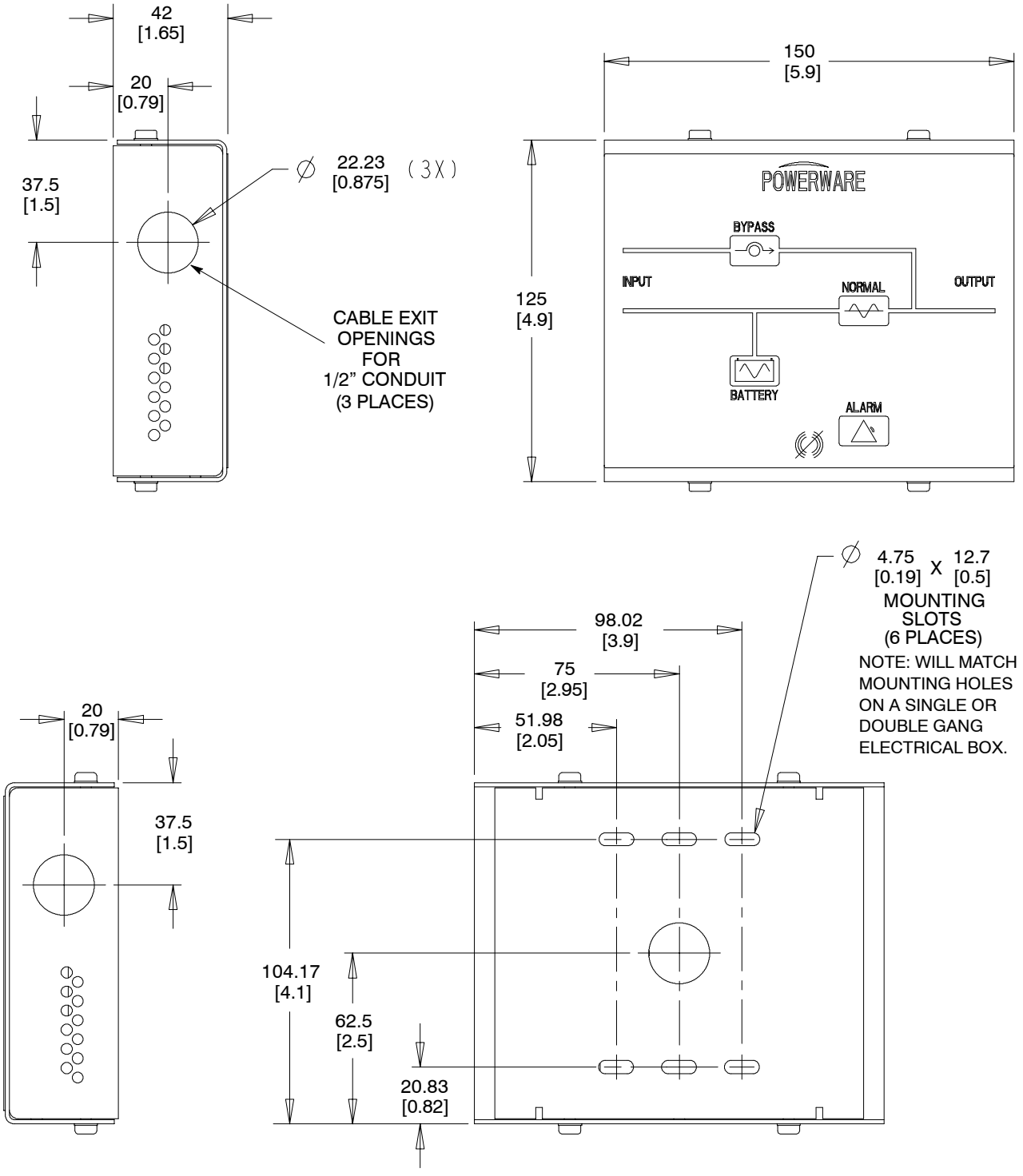


MOUNTING DETAIL

Dimensions are in millimeters and [inches]

NOTE: Interface wiring and conduit between the Remote Emergency Power Off switch and the UPS are to be supplied by the customer.

DESCRIPTION:	**REMOTE EMERGENCY POWER OFF DIMENSIONS**		
DRAWING NO:	164201300–18	*SHEET:*	2 of 2
REVISION:	G	*DATE:*	051502



Dimensions are in millimeters and (inches)

NOTE: Interface wiring and conduit between the Remote Monitor Panel and the UPS mounted Remote Monitor Card are to be supplied by the customer.

DESCRIPTION:	**REMOTE MONITOR PANEL DIMENSIONS**		
DRAWING NO:	164201300–19	*SHEET:*	1 of 1
REVISION:	G	*DATE:*	051502

LIMITED FACTORY WARRANTY FOR THREE-PHASE POWERWARE PRODUCTS

This Warranty applies only to units installed in the Fifty (50) United States of America. Subject to the conditions herein, Powerware Corporation (Powerware®) warrants solely to the initial end–user the electronics (the "Unit") against defects in material and workmanship for a period of 12 months from the date of equipment start up or 18 months from date of receipt by end user, whichever occurs first.

If, in the opinion of Powerware, the Unit fails to meet published specifications and the defect is within the terms of this warranty, the Unit will be repaired or replaced at the option of Powerware with no charge for replacement parts. Labor required, to make the repairs or replacement installation, and travel costs incurred by Powerware's representatives, is not included under the terms of this Limited Warranty, except for labor required during the first 90 days after the date of delivery, provided that start–up, of the unit on–site, has been performed by Powerware. Equipment sold, but not manufactured, by Powerware, e.g., batteries and only the manufacturer of such equipment shall warrant battery racks. Equipment repaired or replaced pursuant to this warranty will be warranted for the remaining portion of the original warranty subject to all the terms thereof.

This warranty does not apply to any Unit that has been subject to neglect, accident, abuse, misuse, misapplication, incorrect installation, or that has been subject to repair or alteration, not authorized in writing by Powerware' personnel, Purchaser shall be invoiced for, and shall pay for, all services not expressly provided for by the terms hereof, including, without limitation, site calls involving an inspection which determines no corrective maintenance is required. THIS WARRANTY IS THE PURCHASER'S (USER'S) SOLE REMEDY AND IS EXPRESSLY IN LIEU OF, AND THERE ARE NOT OTHER, EXPRESSED OR IMPLIED GUARANTEES OR WARRANTIES (INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PURPOSE, WHICH ARE EXPRESSLY DISCLAIMED). In no case will Powerware's' liability under this Warranty exceed the replacement value of the Unit warranted.

Powerware's obligation, under said warranty, is expressly conditioned upon receipt by Powerware of all payments due it (including interest charges, if any). During such time as Powerware has not received payment of any amount due to Powerware, in accordance with the Contract terms under which the equipment is sold, Powerware shall have no obligation, under said warranty; also during this time, the period of said warranty shall continue to run and the expiration of said warranty shall not be extended upon payment of the overdue amount. These limitations, to said warranty, apply even in the event that the equipment is sold initially by Powerware for resale to an ultimate end–user.

In no event shall Powerware be liable for any indirect, incidental special or consequential damages of any kind or type whatsoever, or based on any claim or cause of action, however denominated. Powerware shall not be responsible for failure to provide service or parts due to causes beyond Powerware's' reasonable control. This limited warranty applies only to the original end user of the unit.

Cost for replacement equipment, installation, material freight charges travel expenses and labor of Powerware representatives will be borne by the Purchaser (user). Any advice furnished the Purchaser before or after delivery in regard to use or application of Powerware equipment is furnished without charge and on the basis that it represents Powerware's best judgment under the circumstances. The use of any such advice by the Purchaser is solely and entirely at its own risk.

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